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The challenge of compact urban development in Nicaraguan secondary cities

Ian Joseph Morton

PhD

The challenge of compact urban development in Nicaraguan secondary cities

A thesis submitted in partial fulfillment of the requirements of the University of Northumbria at Newcastle for the degree of Doctor of Philosophy

Research undertaken in the Faculty of Engineering and Environment

Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others.

Any ethical clearance for the research presented in this thesis has been approved. Approval was sought and granted by the ethics committee of the Northumbria University School of the Built Environment.

Ian Joseph Morton

Abstract

Urban sprawl has one definitive characteristic - low intensity/inefficient use of land (Ewing et al., 2008) (Downs, 2000) (Peiser, 2001). Residential densification is the increase in the density of residential land use to combat the negative effects of sprawl. There has been very little academic research on either urban sprawl or residential densification in the specific context of developing countries. This research seeks to address this by looking at the issues in four Nicaraguan secondary cities using a mixed methods approach.

This work develops, for the first time in Nicaragua, a housing typology for secondary cities and a consultation of urban planning professionals on sprawl, density and residential densification.

Eight housing types have been identified, six of which have average densities that are low or medium (but very close to the boundary with low). The other types are outliers with higher densities – one slightly higher, the other much higher.

The consultation has 17 participants and uses a 2-stage Delphi technique. There was consensus that damaging urban sprawl was occurring in each of the cities and that more compact development through residential densification would be beneficial.

Participants identified appropriate methods of residential densification for the case study cities, each of which upon analysis, fits into one of the categories established by the City of Capetown Spatial Planning and Urban Design

Department (2009, p. 6): either higher density development ‘on greenfield sites ... within [a] ... city’s planned growth direction;’ or higher density development on ‘vacant infill sites’ within existing urban areas; or densification lot by lot within existing urban areas, on lots which are already developed.

The consultation revealed current barriers to residential densification, ranging from the enduring “culture of low housing density” in Nicaragua to poor financing options for families to include earthquake resistant foundations in their self-build properties, which would permit safe building on more than a single storey.

Acknowledgments

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Part 1: Introduction, Literature Review and conceptual framing & Methodology

Chapter 1. Introduction

This work explores the problem of urban sprawl and the inefficient use of land for residential development in secondary cities in Nicaragua. It does so at a time of increasing global concern about unsustainable development and its effects in both the environment and people's everyday lives.

1.1 The Research Problem

Klaufus (2010, p.125) writing in a paper on urban sprawl in intermediate or secondary cities in Central America noted that in cities he had visited 'urban areas were expanding in an uncontrolled fashion with high burdens on ecological resources and existing housing markets.' This pattern is evident in Nicaraguan secondary cities. Large amounts of land in the existing urban areas of Nicaraguan secondary cities are either occupied by low density urban development - which shows few signs of being densified - or are completely unused – areas which currently show little prospect of being given a function through infill development (Sampson, 2012). Figs. 1.1 – 1.4 all show scenes from the existing urban areas of Nicaraguan secondary cities. Figs. 1.1 and 1.2 are examples of low density development while fig. 1.3 shows one of the many areas of land which have been left completely vacant. Fig. 1.4 is an aerial view of a section of the city of León which clearly demonstrates the large extent of vacant land within the city's existing urban area.

In fig.1.1 the relatively large amount of space between neighbouring residential structures is visible, as is the very large amount of private outside space belonging to the residential units which is located behind the housing. Both of these factors lower the density at which the housing operates.

Fig.1.1 Image showing low-density housing in a central area of the city of León (Morton, 2009).

Fig.1.2 Image displaying low-density housing in a relatively central part of the city of Granada (Morton, 2009).

Throughout Nicaragua the predominant form of housing is single-storey. Fig.1.2 shows an area of single storey housing in Granada. The large amount of space surrounding individual housing structures is visible.

Fig.1.3 A piece of 'long term vacant' land in a central part of the city of Granada (Morton, 2009)

The large number of pieces of land left permanently unused in the existing urban areas of Nicaraguan secondary cities together make up very significant proportions of the total area occupied by the cities. One such site is visible in fig.1.3.

Fig.1.4 Aerial view of a housing block in central León (Google 2014).

Aerial images of Nicaraguan cities clearly reveal the large number and significant size of unused space within the country's urban areas. For example, in fig.1.4 the expanse of unused space in the centre of a housing block in León is visible. The author is familiar with the housing block in question and it is just one of many such cases, where the land in the centre of the block is not used as a private or shared green space, leisure space, utility space, agricultural space or storage space.

The picture of housing in existing urban areas described above is accompanied by low density urban sprawl taking place on the peripheries of Nicaraguan secondary cities which is consuming green land, much of which previously functioned as agricultural land. In addition, there is increasing concern in Nicaragua that green areas outside of Nicaraguan secondary cities which have special scientific or biological value, or which could be assets for leisure or tourism, are being endangered by the uncontrolled outward growth of the cities. For example, a project report by the AMNLAE - Granada organization (2008) indicated that works were taking place throughout an area of informally developed housing on the southern periphery of the city of the Nicaraguan secondary city of Granada to ameliorate the polluting effects that informally developed pit latrines were having on the cleanliness of water supply to the city. There has also been great concern that Granada's uncontrolled southern expansion is increasingly damaging the ecologically important wilderness areas on the northern aspect of the Mombacho Volcano.

The situation described above is indicative of land use in central areas of Nicaraguan secondary cities not being optimised, in terms of developing economic activity and a range of services and employment and in terms of providing a supply of housing in central, accessible urban locations. In contrast, the cities are seeing the widespread development of land on the urban periphery at low densities, often in an uncontrolled manner and often through informal means. This development of land mainly comprises housing development and it creates communities of residents with poor accessibility to services, employment. This is particularly keenly felt in Nicaragua as car ownership is very low (Dargay and Gately, 2001) and public transport provision is often poorly planned and resourced (La Voz del Sandinismo, 2009) (Aragón Rodriguez, 2014) (Programa de las Naciones Unidas para el Desarrollo 2005).

In addition, security is becoming a major concern in the relatively inaccessible low-density residential communities located on the periphery of Nicaragua's cities (Rodgers, 2004). This is most extreme in Managua, the capital city, but is also keenly felt in Nicaragua's secondary cities.

Forsyth et al (2007) note that basic infrastructure is more challenging and expensive to provide in more dispersed cities and Bredenoord and van Lindert (2010) confirm that the dispersed nature of development in Nicaragua's secondary cities is certainly having this effect. Nicaragua's coverage of electricity provision is already the lowest in Central America and only 20% of its roads are considered to be in good condition (Banco Interamericano de Desarrollo 2014).

The issues described here constitute the research problem that this thesis will address. This work will approach the problem from a housing perspective and will identify the barriers to more compact development of the secondary cities through residential densification (raising average net residential densities).

1.2 Urban sprawl, secondary cities and ‘pragmatic incrementalism’ in Nicaragua

Urban sprawl blights countries all around the world and can mean that communities of people find themselves living far from urban services and as a result are excluded from the social and economic benefits of the city. This effect is exacerbated for those living without access to private motorised transport. Urban sprawl also makes core infrastructure for housing such as roads, water and sewerage lines and connection to an electricity supply more expensive to provide. Furthermore, sprawling urban areas occupy land in an inefficient manner leading to excessive destruction of green areas surrounding cities that could otherwise be used for activities including agriculture, leisure and tourism. This thesis explores the issue of urban sprawl in 4 case study cities in Nicaragua. These are the cities of Granada, León, Masaya and Matagalpa. Their size relative to other urban settlements in the country means they are all classified as secondary cities.

In Nicaragua, the adoption at a national level of a strategy of urban dispersal means that the growth of secondary cities is encouraged as they are developed particularly as alternative migration destinations to the capital city for rural to urban migrants (Gobierno de Nicaragua 2006). Whether or not as a direct result of the strategy, secondary cities are experiencing the fastest rates of population growth in the country (INIDE 1995, 2008). As a result, effective urban planning and housing development is critically required in these cities. Data from Nicaraguan local policy documents (León, 1998) (Alcaldía Municipal de Masaya, 2005) (Alcaldía Municipal de Matagalpa, 2004) and from the scoping research conducted as part of this study highlights an acute housing need in the secondary cities. The phenomenon of rapid secondary city growth in Nicaragua presents an interesting and worthwhile context in which this study can explore the issue of urban sprawl and examine how it can be avoided.

Scoping research conducted to inform the design of this study has revealed an almost complete absence of effective direction from central government in Nicaragua in the area of urban planning and housing. There are currently no urban planning or housing plans at the national level in Nicaragua and almost all plans, policies and activity in this area are at the local level. In recognition of these constraints, this research focusses on how the resources, direction and capacity found at a local level in the case study cities can be used to manage urban sprawl. The effectiveness of working at a local level towards urban development interventions is noted in literature, including that describing the concept and practice of city to city cooperation (Bontenbal and Van Lindert, 2008) (Ruiz Seisdedos 2006). The study focuses particularly on the role of local government in each of the case study cities.

Although working at a local level in Nicaragua currently offers superior prospects for making improvements to urban environments than working through national agencies and institutions even locally led development in Nicaragua's secondary cities encounters serious problems. In each of the case study cities, the scoping research identified very serious challenges as regards local government's implementation of existing plans and policy in the area of urban planning and housing. Urban planning and housing plans do exist at a local level in all 4 of the case study cities. In spite of this, much of the content of these existing local plans shows no signs of being put into practice and is left unimplemented. This research therefore takes the position, with a view to determining how urban sprawl can be avoided in the case study cities, that long and complicated policy plans outlining wholesale change and requiring the mobilisation of very large amounts of resources and the completion of a complicated series of actions are unrealistic and are unlikely to be implemented in practice. Although the importance of thorough long term planning in the arena of urban development is acknowledged, the position of this research is that the unresolved nature of existing policies and the immediate need to reduce low density sprawl dictate that effective measures for reducing urban sprawl must be pragmatic and incremental. Literature which identifies ‘pragmatic incrementalism’ as an effective approach to achieving change at a local level supports this standpoint (Bryant, 2003) (Evans et al 2005).

1.3 The compact city and residential densification

In order to address the inefficiencies and problems caused by urban sprawl, models have been developed internationally for more compact urban development. However, different thinkers in the field see the ideal layout for more compact cities differently and ideas include ideas as diverse as: multiple high density urban nodes; single urban centres with high densities encouraged in central areas and in areas where accessibility to the centre is good; and mobility corridors around which densities are optimised. Despite being diverse, central to each of these ideal layouts is the desire that urban development is planned and carried out in such a way as to achieve efficient use of land.

Housing is the predominant land use in urban areas throughout the world and it is this type of land use on which this thesis focuses. Where the density of existing areas of urban housing is low, models of compact urban development encourage the increase of densities through infill development and through retrofitting of existing plots and structures. Meanwhile, these models of more compact development state that the densities of new housing developments should also be optimised. The process of raising housing densities in this way is known as ‘residential densification.’

Theoretical and empirical work, both in an academic and policy context covering urban sprawl, models for more compact cities, housing densities and residential densification have, until now, mainly concerned developed countries. In fact, in many urban areas in developing countries, particularly in Asia and the Middle East, urban densities are already high. In these parts of the world, this is particularly the case for residential areas occupied by low income groups. It is interesting to note that some of the critics of models of more compact urban development city as a development ideal suggest that it is based on a naïve Eurocentric longing for contemporary cities to imitate the urban form of compact historic European towns and cities. Whatever the reason, in academia and in praxis the area of more compact urban development has been neglected across the Global South (Jones 2000). This has meant that even in developing countries where low-density urban housing forms predominate there has been relatively little research on these topics. Nicaragua is an example of a country where low-density urban forms predominate. Other examples include other states in Central America as well as nations across sub-Saharan Africa including the Democratic Republic of Congo, Cameroon and South Africa.

1.4 Understanding the research problem

Very little data exists on the nature and extent of urban sprawl in Nicaraguan secondary cities or on the types of housing which might contribute most to this sprawl – or, indeed, on which types may offer the greatest hope for reducing sprawl. There is also currently no data giving a detailed picture of housing densities in Nicaragua, either linked or not to housing typologies. Moreover, there is no real understanding of the barriers to adoption of the compact city approach or residential densification in Nicaraguan secondary cities. Building up this data, analysing it and producing findings in this study will develop valuable original knowledge.

1.5 Aims and objectives of the thesis

1.5.1 The overarching aim

Given the discussion above about the nature and scale of the problem of urban sprawl in Nicaraguan secondary cities and the lack of data on this phenomenon or on potential solutions, the aim of this thesis is to help improve knowledge on housing densities, urban sprawl and the possibility of developing more compact secondary cities through residential densification in Nicaragua. As a result, it is also hoped that the work can contribute to discourse on these topics in developing countries more widely, particularly in those countries where low-density urban form predominates.

1.5.2 The sub-aim

This thesis will identify and explore the challenges to residential densification in Nicaraguan secondary cities

1.5.3 The research objectives

The research objectives of the thesis are to:

1. establish a housing typology for Nicaraguan secondary cities and measure the average housing densities for each of the housing types (this is required in order to identify which housing types contribute most to urban sprawl and which may offer opportunities for more compact development)

2. explore the perceptions of Nicaraguan urban development professionals on whether or not low-density urban form and sprawl are problems in the case study cities and whether or not more compact models of urban development including residential densification should be employed in future

3. explore the perceptions of the urban development professionals as to the possible methods for residential densification which could be used in the case study cities

4. assess the urban development professionals' technical knowledge on measuring housing density

5. explore the urban development professionals' experience and perceptions of the challenges to residential densification in the case study cities

note: exploring the perceptions and knowledge of Nicaraguan urban development professionals through objectives 2, 3 and 4 may reveal challenges to residential densification in terms of support/lack of support, suggestions/lack of suggestions and knowledge/lack of knowledge

1.6 The layout of the thesis

This thesis is organised into 4 parts and 8 chapters in total. Part 1 consists of chapters 1 – 3, the introduction, the literature review and conceptual framing, and the chapter on methodology. The introduction identifies the research problem which the thesis addresses and introduces themes critical to the research problem such as urban sprawl and the idea of the compact city, both in their international context and specifically in relation to Nicaragua. The introduction also articulates the research aims and objectives of the thesis. Chapter 2 (the literature review and conceptual framing) identifies and explores the concepts and themes from literature on which this thesis is based. The chapter seeks to frame the way in which the thesis develops. Chapter 3 sets out the research methodology which has been developed in order to achieve the aims and objectives of this work. The methodology employs a mixed-methods approach and uses scoping research to guide the evolution of the work. It is interesting to consider where the philosophy of research lies in terms of the extent to which the research takes existing theory and seeks to verify it or whether it begins with a theoretical ‘blank slate.’ In this sense, the work is located somewhere between the relative extremes of positivism and Grounded Theory. Admittedly, this is a quality shared by much qualitative or mixed methods research. The work develops novel approaches to establishing a housing typology for an area and for measuring net residential density in 4 case study cities. A 2-stage Delphi technique is used to gather, refine and analyse qualitative data from Nicaraguan urban development professionals aimed at exploring the challenges to residential densification in the case study cities.

Part 2 of this thesis (findings 1, current context and housing typology) comprises chapter 4 (the Nicaraguan context and the case study cities) and chapter 5 (developing a housing typology). In chapter 2 (literature review and conceptual framing) it was identified that there is a lack of academic literature on Nicaragua concerning urban sprawl, compact urban development, housing densities and residential densification. Given this, chapter 4 discusses Nicaragua generally in relation to the major findings from the literature review and presents the current context of the 4 case study cities, so that the reader may be more familiar with the topographical, historical, political and socio-economic situation. Chapter 5 responds to the lack of data on housing type and density in Nicaraguan secondary cities by establishing for the first time a housing typology for the cities with measures of net residential density calculated for each housing type.

Part 3 of the thesis (findings 2, the challenges to residential densification) is made up of a single chapter (chapter 6, understanding of the challenges to residential densification). In this chapter, the data from the 2-stage Delphi technique conducted with Nicaraguan urban development professionals is analysed in detail and findings are generated from the data, identifying and exploring the challenges to residential densification in the case study cities. The data here covers research objectives 2 – 5.

Finally, part 4 of the thesis (evaluation and conclusion) comprises 2 chapters, chapter 7 (evaluation of the challenges to residential densification) and chapter 8 (offering to knowledge and scholarship). In chapter 7 the findings generated in parts 2 and 3 of the thesis are analysed with reference to literature in order to directly address the thesis' sub-aim (to identify and explore the challenges to residential densification in Nicaraguan secondary cities). Chapter 8 provides a conclusion which summarises what the work offers and how it is original as well as identifying possible limitations of the work and ideas for its future extension.

Chapter 2. Literature Review and Conceptual Framing

This chapter sets out the key ideas from current literature which underpin this thesis. It identifies the main conceptual framework within which data on Nicaraguan cities will be discussed and analysed. The chapter begins by discussing the history of understanding of urban sprawl. It goes on to explore the concept of the 'compact city' and continues by moving on to define housing density and identify how it is measured. The chapter then goes on to provide a perspective on the different geographical levels at which urban development and international cooperation can take place within a country. The chapter finishes with a detailed review of the history and current picture of housing provision in Central America and Nicaragua by the state, private sector and via other providers.

2.1 A note on the validity of distinguishing 'developing' from 'developed' countries

Paran and Williams (Paran and Williams, 2007) remind us that classifying countries as developed or developing can at times be problematic and that some have questioned the validity of doing so. They highlight that the UN has no protocol for identifying countries as 'developing' although the United Nations Development Program (UNDP) does issue lists of 'less developed' and 'least developed' countries based on 'a combination of human and economic indices' (Paran and Williams, 2007).

Jenks (Jenks, 2000) in his introduction to the groundbreaking and seminal text on sprawl and the compact city in economically developing parts of the world entitled 'Compact cities: sustainable urban forms for developing countries' concedes that ‘there are many similar characteristics, as well as significant differences, in cities across this divide [the so called divide between developed and developing countries].’ He also notes that ‘it is recognised that the division is an oversimplification‘ (Jenks, 2000). However, he also makes clear that it is a valuable and necessary simplification to make. One of the ways in which this simplification can be useful is so that contributors to academia and public policy have a way of referencing the fundamentally different ways in which countries at different stages of development experience issues such as governance, the influence of social and political hierarchies and the need for shelter and mobility. Urban sprawl is also something that countries at different stages of development experience in fundamentally different ways.

There is a surprising scarcity of academic literature on protocols for distinguishing developed from developing countries or about the results of any such endeavour. In fact, it is Jenks (Jenks, 2000) in setting the ground for the text ‘Compact cities: sustainable urban forms for developing countries’ who provides the main reference point for those hoping to bring about this distinction for the purposes of studies relating to urban development. He suggests that the world’s developed countries should be considered as those who are members of the Organisation for Economic Co-operation and Development (OECD). Using this classification, this study works on the basis then that the world’s developed countries are the 34 current OECD member countries (OECD, 2011). An analysis of the list reveals that these countries are all located in the traditional centres of world economic and political hegemony, i.e. Europe and Israel, North America and Australasia. Under this classification system all other countries in the world are by definition developing countries.

Fig.2.1 below shows the OECD member countries on a map of the world. Both the countries marked in light blue and dark blue are member countries. The map demonstrates how little of the world's land surface area is occupied by 'developed' countries, as distinguished by being OECD member countries, and highlights how much of the world is left under-represented by the current state of academic literature, internationally visible practice based literature and empirical data covering urban sprawl and density. It is also the case that non OECD member countries also account for the vast majority of the world's population (OECD, 2012), in which case the under-representation caused by the state of current knowledge on urban sprawl and density seems even more severe.

Fig.2.1 World map showing OECD member countries (Mukhopadhyay, 2010)

There are undoubtedly differences between developing and developed countries as classified using the 'OECD membership approach' as concerns urban sprawl and density. Nonetheless, it should also be kept in mind that there are of course huge differences between - and even within some - non-OECD countries. There are differences in the historical, cultural, ethnic, religious , geographic, climatic and economic ambits (Jenks, 2000).

It is the opinion of the author that despite the wide and major differences that are often found from one developing country to another (Jenks, 2000) it is a valid exercise to seek to increase the collective body of knowledge about urban sprawl in developing countries. There are enough shared challenges across the developing world that are either a function of or a cause or urban sprawl to validate this pursuit. These challenges exist in areas including urban planning, governance, housing and the environment. The challenges are also felt in ways that are significantly different enough between developing and developed countries to justify bringing out this distinction

2.2 Urban sprawl - a variety of definitions and viewpoints

Large areas of cities all over the world are assuming a dispersed and sprawling urban form and housing as a major urban land use is at the forefront of this phenomenon. This type of urban development has been termed ‘urban sprawl’.

Definitions of urban sprawl are many and varied (Bourne, 2001) (Bruegmann, 2006) and range from the all encompassing to the very narrow. Views differ on what characteristics if present in an area confirm the existence of urban sprawl, although low-development densities are very regularly identified as being a defining feature (Downs, 1998) (Brueckner, 2000). However, Johnson (Johnson, 2001) identifies that the fact that there is ‘no common agreement ... on the defining characteristics‘ of sprawl creates a difficulty in this field. Galster, Hanson et al

(Galster et al., 2001), in their work aimed at bringing methodological rigour to defining urban sprawl, highlight how much conjecture there is around the notion of sprawl and in defining the nature of the phenomenon.

For many people with a passing interest in urban planning/development matters the most visible and mainstream narrative available is likely to be that urban sprawl is a negative phenomenon as regards the desire for modern, vibrant cities. In fact, in addition to disagreement over exactly how to define urban sprawl, there is also a great deal of debate within academia and in practice over whether urban sprawl should be seen as a ‘friend or foe’ of sustainable urban development. In fact, many definitions provided for urban sprawl betray implicitly the view of those creating the definition as to whether they believe it is inherently a good or bad thing. This state of ‘fuzziness’ blurs the lines between objectivity and subjectivity with regard to defining what urban sprawl is and whether or not it is a positive thing for successful, sustainable urban areas. Very convincing pros and cons of urban sprawl have been developed by those in favour and those against it and some academic and some of those in practice occupy an intermediate position.

Fig.2.2 illustrates the dilemma over the relative merits of urban sprawl from the perspective of a ’normal person’ greeting the sprawling growth of the city. For example, are the people in the cartoon hopeful about the ‘arrival’ of the city or are they fearful?

Fig.2.2. Cartoon depicting the onward march of urban sprawl (artist, 2010)

2.2.2 The lack of literature covering urban sprawl in developing countries

The bulk of discussion about urban sprawl in academic literature and in policy and other 'practice based' material which has had an international reach has concerned developed countries (Burgess, 2000) (Angel et al., 2005). Bruegmann (Bruegmann, 2006) in his otherwise comprehensive work "Sprawl: a compact history" fails to refer at all to the history or current dynamics of the phenomenon in developing countries. In comparison to the intensity of the debate on urban sprawl in economically developed countries it is relatively difficult to find literature from/or on economically less developed regions of the world which covers the topic in detail. When discussing economically developing nations, Bruegmann, despite admitting that his 'knowledge of these communities out[side] of the [global] economic mainstream is so incomplete' (Bruegmann, 2006) opines that 'sprawl does not seem to be a major preoccupation of ... [these countries] inhabitants' (Bruegmann, 2006). It is the opinion of this author, that Bruegmann is on relatively shaky ground in terms of academic rigour when he extrapolates that a lack of literature and detail on urban sprawl in written form from/or on developing countries signifies that 'it is not a major preoccupation' in those societies. A better representation of the nuances of the current situation may have been provided by saying that the topic has not been expressed in formal academic or internationally visible practice based literature as ‘a major preoccupation.‘ A small number of academic writers have punctured the assumption that sprawl is not of major interest for the residents or policymakers of developing countries (Angel et al., 2005) (Cohen, 2006) .

In addition to works of academic writing and practice based material with international reach, there has also been relatively little collection of ‘hard and fast’ empirical data sets on urban sprawl in developing countries (Angel et al., 2005), including on measuring in detail the extent to which it is happening and on how sprawl, and urban density more widely, are viewed by the general population and by planning and housing policymakers.

To sum up, it is very difficult to detect in international academic discourse or practice based material like plans, policies or research documents evidence of definitions of sprawl, viewpoints about sprawl, or data about sprawl which are specific to the economic, social, environmental and political context of developing countries. This thesis aims through in the field research in Nicaragua to contribute to the extent of current academic literature about urban sprawl in developing countries.

2.2.3 Competing interpretations of the relative ‘goods and bads’ of urban sprawl: an introduction

Through the analysis of academic literature and practice based material with international visibility conducted as part of this study, three schools of thought have been identified which interpret the relative ‘goods and bads’ of urban sprawl in definitively different ways. This study has generated the terms: ‘anti-sprawl view,’ ‘pro-sprawl view’ and ‘intermediate view’ to describe these viewpoints.

Generally, and particularly in academia, it is the anti-sprawl and intermediate views which are, on balance, the most prevalent. The majority of academics engaged in the study of the built environment who have written about urban sprawl consider it to be an urban form which creates more negatives than positives (CEC, 1990) (Breheny, 1992) (Basiago, 1998) (Jenks et al., 1996) (Brueckner, 2000) (Bourne, 2001) (Ewing et al., 2008) (Heng and Malone-Lee, 2010a) (Shin, 2010). In fact, the fundamental difference between the anti-sprawl and intermediate views, terms which have been generated as part of this study, is that, those espousing the intermediate view, despite being fully aware that sprawl has a number of disadvantages, make a more conscious and concerted attempt than those espousing the anti-sprawl view to fully and fairly account for both the advantages and disadvantages of sprawl. The ‘intermediates’ actively seek out the possibility that sprawl can have significant benefits as well as disadvantages whereas those taking an anti-sprawl point of view do not. It may be that those with an intermediate point of view have not completely given up on the idea that sprawl can be good.

Those occupying the intermediate view work hard to balance a sober analysis of the possible damage caused by sprawl with an openness and pragmatism towards identifying where ‘sprawl like form’ may be able to play a productive role in building sustainable urban communities. Some writers occupying this position do so partly in response to their worries about an unfair dominance of the anti-sprawl position in academia. They are careful to acknowledge any realistic benefits of sprawl and seek to ‘step back’ and reframe the conception of sprawl away from its contemporary stigma (Ewing, 1997) (Williams, 2000) (Bruegmann, 2006) (Roaf, 2010).

One of the first parts of the world to identify and describe in detail the phenomenon of urban sprawl and discuss its relative pros and cons was the UK (Bruegmann, 2006). In addition, those writing from and/or about the UK have continued to be a major contributors internationally to the discourse on urban sprawl. The anti-sprawl view, and to a lesser extent the intermediate view, have featured strongly in the UK since as early as the 1920s (Bruegmann 2006). Since the 1920s, the UK government has intermittently shown commitment to both points of view. In the last two decades, a key publication which saw the UK government promoting the anti-sprawl/intermediate view relatively forcefully was the Urban Task Force’s 1999 document ‘Towards an urban renaissance’ (Bennett, 2006) (Urban Task Force, 1999). Pages 26 to 38 of the report provide a critical analysis of residential development in the UK since the 19th century, much of which has often focussed on low-density provision in the suburbs. Looking to the future, a central premise of the report is that ‘increasing the intensity of activities and people within an area is central to the idea of creating sustainable neighbourhoods (Urban Task Force 1999, p.60). Concerning density specifically, the report made the following recommendations as to how to develop more sustainably in urban areas in the future:

> *Revise planning and funding guidance [issued by UK central government] in order to:*

> - *discourage local authorities from using arguments of [excessive] ‘density’ and ‘over-development’ as reasons for refusing planning permission;*
> - *create a planning presumption against excessively low density urban development;*
> - *provide advice on use of density standards linked to design quality*
>
> (Urban Task Force 1999, p.64)

The recommendations above from the Urban Task Force mainly focus on creating an environment, as regards governance and legislation which encourages local government - and particularly their planning departments - to take a friendlier view of higher density development opportunities during decision making. Critically, the final recommendation acknowledges that good design is crucial to making higher density options work.

As regards publications other major publications of international reach covering density, six years after the publication of the Urban Task Force’s document, another report by a national government succeeded in putting across the case against sprawl in a succinct and convincing manner. New Zealand’s Ministry for the Environment (Ministry for the Environment of New Zealand, 2005) provided, in the view of the author, one of the best summaries of the disadvantages of sprawl available. The document provides an effective summary of the common arguments put forward against sprawl by those occupying the anti-sprawl and intermediate positions.

However, although academics and those in practice who make contributions that are ‘anti-sprawl‘ or ‘intermediate’ in nature identify many of the same disadvantages of sprawl as they develop their positions on the issue, there are a wider range of opinions about what are appropriate solutions to sprawl and exactly what constitutes a more desirable urban form. Indeed, solutions to what are viewed as current problematic trends of sprawl and plans for urban forms of the future feature suggestions that are far more nebulous and less fully formed than those which come up purely about whether sprawl is a good or bad thing.

A much smaller group of academics and those in practice make contributions that belong to the viewpoint described in this study as the ‘pro-sprawl view.’ Examples include contributions from Gordon and Richardson (Gordon and Richardson, 1997) (Gordon and Richardson, 2001), Brooks (Brooks, 2004), Bogart (Bogart, 2006), Heartfield (Heartfield, 2006), Hubble (Hubble, 2006a) (Hubble, 2006c) and Vale and Vale (Vale and Vale, 2010). ‘Pro-sprawl’ writers often decry the current ‘fashions’ in western academic thought for bemoaning sprawl (Bourne, 2001) and assert that it can be an appropriate and pragmatic development option which can produce successful urban areas.

In the UK, there is a relatively notable group of public sector practitioners who support the ‘pro-sprawl view’ and although small in number this collection of individuals have been in recent years fairly vociferous in promoting their beliefs. The merits of low-density and dispersed suburban development with far less growth constraints than at present have been championed by senior UK public sector figures including Jon Rouse, the former chief executive of the now disbanded Housing Corporation (Bennett, 2006). Shelagh Grant, chief executive of the Housing Forum, a UK membership organisation representing public and private sector interests has also spoken out in favour of such growth (Grant, 2006). Jon Rouse's support for low-density and dispersed suburban development is of particular interest as he was the secretary of the secretariat responsible for producing the Towards an Urban Renaissance document which largely expressed an anti-sprawl view. This either represents a fairly major change of position regarding sprawl on the part of Mr Rouse or suggests that he was unable to influence significantly the standpoint of the 1999 document.

In addition, Bruegmann notes in his book 'Sprawl: A compact history' (Bruegmann, 2006) that some of the most meaningful debate over the rights and wrongs of sprawl is manifest in the dialogue and the juncture between academia, urban planning and housing practitioners and communities themselves. He also reminds us vividly of the degree of subjectivism involved in the debate on sprawl when he writes that 'one person's sprawl [is] another's cherished neighbourhood' (p.18). Figure 2.3 below is a diagram summarising the 3 'viewpoints' on urban sprawl.

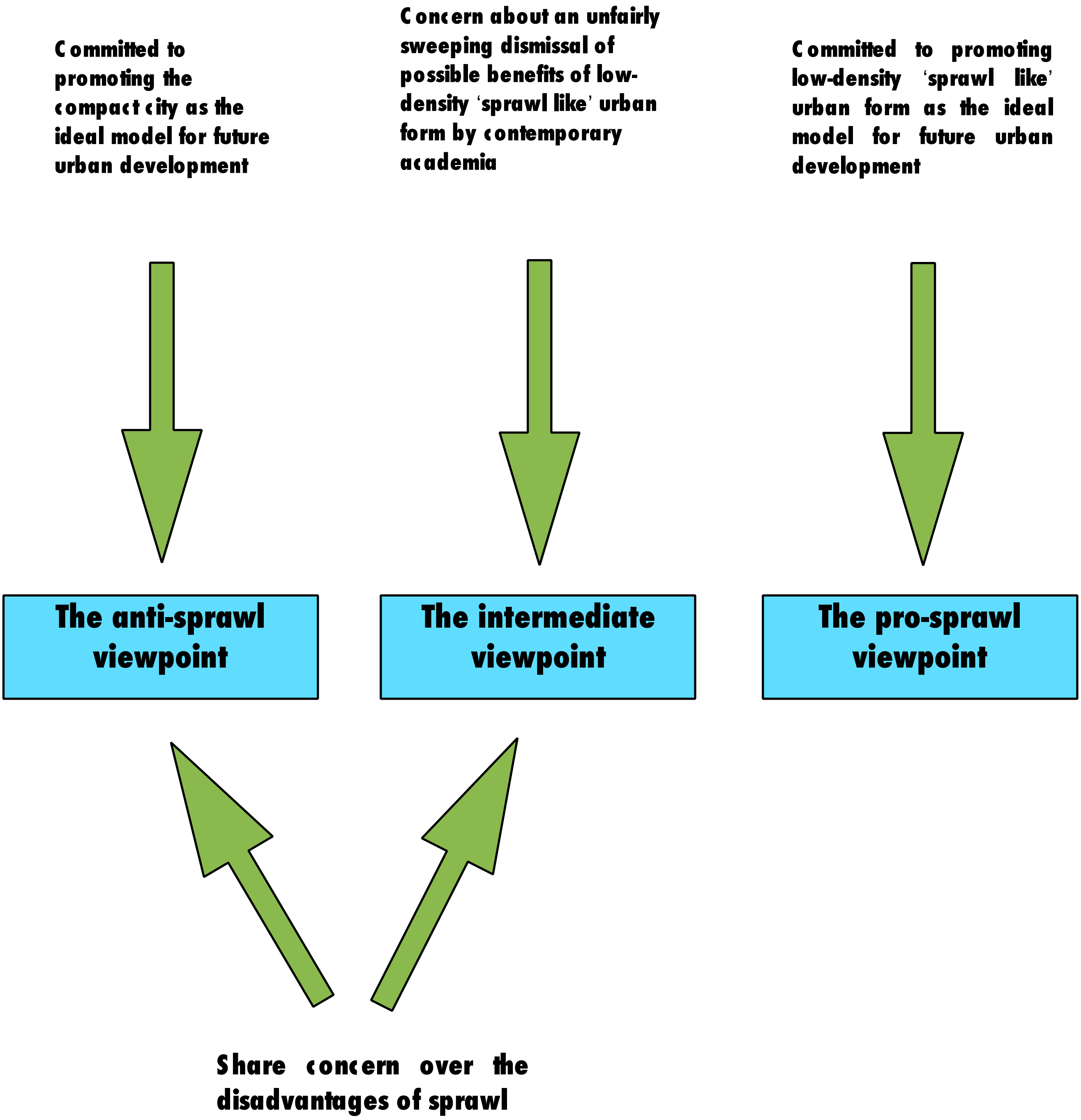

Fig.2.3. Summary of the positions of the 3 'viewpoints' on urban sprawl

2.2.4 Definitions of sprawl

On the whole, within definitions of urban sprawl there is an indication of whether those who provide the definitions - they may be academics or professionals working in practice - occupy an anti-sprawl, intermediate or pro-sprawl viewpoint. So, generally, definitions of urban sprawl convey a subjective description of the phenomenon and many of the most widely encountered definitions, particularly in academic texts, reflect a subjective anti-sprawl position.

For example, Brueckner's (Brueckner, 2000) definition of urban sprawl as the 'excessive spatial growth of cities' may be pithy but it carries with it the inference that all urban sprawl is 'excessive.' On the whole, the idea that something is 'excessive' brings with it decidedly negative connotations. Therefore, we can assume that 'excessive spatial growth' is an unfavourable thing to happen to a city. Ewing et al (Ewing et al., 2008) provide a far more detailed definition of sprawl than Brueckner's but within it there is still the inference that sprawl is bad. For example, they use the terms 'lack of' and 'poor' when describing its main traits. According to them, sprawl is defined as:

> *any environment characterized by (1) a population widely dispersed in low- density residential development; (2) rigid separation of homes, shops, and workplaces; (3) a lack of distinct, thriving activity enters, such as strong downtowns or suburban town centers; and (4) a network of roads marked by large block size and poor access from one place to another*
>
> Ewing et al (Ewing et al., 2008)

Peiser (Peiser, 2001) explains how various definitions provided by the academic community have 'upped the ante' in terms of pure and untrammelled opposition to sprawl. This has been fairly successful at creating a mainstream interpretation of sprawl as a phenomenon that offers nothing positive. Peiser identifies how 'the term is used variously to mean the gluttonous use of land, uninterrupted monotonous development, leapfrog discontinuous development and inefficient use of land.'

Fig.2.4. An area of sprawling housing in Dallas County, Iowa, USA. (Betts, 2000)

Figure 2.4 shows a 'sprawling' suburban residential development in Dallas County, in the US state of Iowa. The area in the image displays many characteristics of sprawl which those who espouse the anti-sprawl viewpoint, and to an extent those who support the intermediate viewpoint, often highlight and consider to be wholly negative phenomena, e.g. widely dispersed housing units, a separation of housing from other land uses including service provision (Ewing et al., 2008) and 'leapfrog discontinuous development' (Peiser, 2001).

In many ways, the most balanced and inclusive definition of urban sprawl identified by the author from any of those who contribute to the range of the anti-sprawl viewpoint comes from (Downs, 2000). His approach is to identify the ten most salient features of sprawling urban form and in doing so produces a definition which is comparatively broad and all-encompassing in terms of the extent to which it recognises the importance of economic factors and factors concerning planning control and governance in determining how urban sprawl looks and feels to those urban dwellers with life experience of it .

Downs' ten traits of sprawl are (Downs, 2000):

- *Unlimited outward extension of new development*
- *Low-density residential and commercial settlements, especially in new-growth areas*
- *Leapfrog development jumping out beyond established settlements*
- *Fragmentation of powers over land use among many small localities*
- *Dominance of transportation by private automotive vehicles*
- *No centralized planning or control of land uses*
- *Widespread strip commercial development*
- *Great fiscal disparities among localities*
- *Segregation of specialized types of land uses in different zones*
- *Reliance mainly on trickle-down to provide housing to low-income households*

(Downs, 2000)

The author's analysis of the definitions of urban sprawl which have been explored in the previous paragraphs, provided by Ewing et al (Ewing et al., 2008), Peiser (Peiser, 2001) and Downs (Downs, 2000) has revealed that there is only one 'common definitive characteristic of sprawl' that all three include. It is that of low intensity/inefficient use of land. Within this, Ewing, Schmidt et al (Ewing et al., 2008) and Downs (Downs, 2000) refer more specifically to low-density residential development. These phenomena are absolutely central to the majority of conceptions of urban sprawl (including those coming from anti-sprawl, intermediate or pro-sprawl viewpoints) and they are a key preoccupation of writers occupying an anti-sprawl viewpoint who view them as having wholly negative impacts. In this analysis of the different definitions to come from anti-sprawl contributors Brueckner's offering (Brueckner, 2000) was not considered as it is so much briefer than the others.

2.2.5 The damage caused by sprawl

Bruegmann (2006) in his work 'Sprawl: a compact history' presents an interesting structure for his description of the history of international anti-sprawl rhetoric. He theorises that significant anti-sprawl sentiment only ever develops in a society when low density suburban or exurban housing becomes available to people from outside the social and political elite. He also believes that in the history of major anti-sprawl movements throughout the world there have been three main 'anti-sprawl campaigns' (Bruegmann 2006, p. 117).

The narrative structure Bruegmann adopts in his 2006 work, arranging it around what he terms the three main anti-sprawl campaigns, will be adopted here. The evolving conception of how urban sprawl causes damage, according to those contributing to the anti-sprawl viewpoint, will be explored arranged in the chronological order of how it developed and was given rhetorical form. Bruegmann's structure allows coverage not only of how writers' and practitioners have understood the problems associated with sprawl but also of the historical narrative in which these problems were put into written form.

Bruegmann (Bruegmann, 2006) notes that suburban or exurban dwellings and buildings serving other urban functions have existed ‘from time immemorial’ (Bruegmann, 2006). They were a feature on the outskirts of both ancient Babylon and Rome and surrounded Chinese cities during the Ming dynasty. Low-density living was mainly the preserve of the richest and most powerful in society who valued the ample space available on the outskirts of cities and had the resources to take advantage of it, constructing large, elegant residences. Figure 2.5 is a picture of the Villa of the Mysteries, the remains of a villa built by a wealthy family which formed part of an ancient Roman low-density ‘suburb.’

Fig.2.5. The Villa of the Mysteries in Rome, Italy. (Milloway, 2011)

Bruegmann (Bruegmann, 2006) reflects that anti-sprawl rhetoric has at times in the past been little more than a thinly veiled - or even an unapologetically unveiled - criticism by social and economic elites about ‘lower orders‘ in society occupying spacious areas of land for housing for the first time. As previously mentioned, Bruegmann remarks that significant opposition in societies to low-density suburban or exurban residential development seems to develop whenever the ability to inhabit sprawling residential plots widens to include groups of people other than the minority social and political elite. Bruegmann (Bruegmann, 2006) suggests that 18th century Britain was an example of such a time in history, when for the first time in that particular country's history a politically and economically liberated urban middle class bought land and built houses in erstwhile rural land near cities. The traditional land owning British elite, who had until then ruled supreme in the countryside, became rather concerned and very vocal about what they saw as a disruption of the 'natural order of things' (Bruegmann, 2006).

2.2.6 'The [world's] first anti-sprawl campaign'

The 1920s in Britain saw what Bruegmann (Bruegmann, 2006) calls 'the [world's] first anti-sprawl campaign' which sought to debase the 'screaming mess' (Williams-Ellis, 1937) being made of the nation by the very rapid growth of suburban mainly semi-detached housing built at relatively low residential densities and which were being occupied by increasing numbers of Britain's middle classes. This 'world's first anti-sprawl campaign' was of course a long time before the threat of the greenhouse effect and climate change added a hugely significant new impetus to those opposing urban sprawl. Although the 'first anti-sprawl campaign' replicated some of the class snobbery of the anti-sprawl rumblings in Britain in the 18th century it did at times bring up more objective practical concerns. For example, productive agricultural land was being consumed at an alarming rate by the onward march of the suburbs (Steadman, 1977) and traffic congestion was being made worse by the building of a style of housing which promoted the use the car (Pooley and Turnbull, 2005). It is perhaps surprising to learn that a major argument which is often levelled in the 21st century against sprawl - namely that it increases car use which is damaging - actually began in 1920s Britain.

2.2.7 The ‘second anti-sprawl campaign’

According to Bruegmann (Bruegmann, 2006) the world’s ‘second anti-sprawl campaign’ took place in the USA after the Second World War. One of the movement’s pioneering texts was ‘The Exploding Metropolis’ edited by William Hollingsworth Whyte (Whyte, 1958). The book was based on the ideas discussed in a conference convened by Whyte, then a journalist at Fortune magazine, at which many of the country’s prominent thinkers on urban matters were in attendance. These included the respected urban planners Charles Abrams and Edmund Bacon from New York and Philadelphia respectively, the well known housing reformer or ‘houser’ (Oberlander and Newbrun, 1999) Catherine Bauer Wurster, Wilfred Owen an authority on urban transport and later author of books including ‘Cities in the Motor Age’ (Owen, 1970) and ‘The Accessible City’ (Owen, 1972) and Douglas Haskell long time editor of the ‘Architectural Forum’ (Bruegmann, 2006). Both the Fortune conference and the book which resulted from it were overwhelmingly critical of patterns of low-density suburban housing development that were occurring at the time and they lamented the demise of the dense city tradition which they believed brought benefits to the city in multiple ways (Bruegmann, 2006).

Numerous diverse reasons were put forward in the conference and book as to why low-density urban sprawl was damaging, reflecting the diversity in the conference participants’ main areas of expertise. These foundations for opposition informed the following years of the ‘second anti-sprawl campaign’ (Whyte, 1958) (Bruegmann, 2006) which were to take place throughout the 1950s, 60s and into the 70s. Bourne (Bourne, 2007) describes how the anti-sprawl movement was continuing to spark intense debate into the 1970s.

During the course of the ‘second anti-sprawl campaign’, it was claimed by those opposing urban sprawl that low-density settlements involved significantly higher development and maintenance costs than higher density settlements. A number of urban professionals also linked increased low-density urbanisation with pollution, particularly through increased vehicle emissions, and also linked it with increased incidence of flooding as new urban development interfered with the movement of water through the ground. Regarding the automobile, it was widely concluded that the building of suburban communities was leading to an increase in car ownership in society and an increased dependence on cars for mobility. It was also evident that more cars needed more roads and there was great opposition to the effects that building more roads - particularly urban freeways - were having on the aesthetics and liveability of the urban landscape. It was also claimed that cars overly promoted individualism in society and eliminated many communitarian aspects of pre-car society (Bruegmann, 2006).

It was also thought by some that low-density suburban areas made social isolation and disaffection more common. One of the most prominent writers to argue this was Jane Jacobs, whose book ‘The death and life of great American cities’ (Jacobs, 1961) sought to provide a timely riposte to urban development policies being implemented in the US at the time including those which she considered among other things were creating unsustainable urban sprawl and dead cities. She heavily criticised what she saw as US authorities’ unshakeable belief that dense urban neighbourhoods made up of historic buildings were incapable of providing acceptable living conditions. This was resulting in a drive towards the demolition of such communities and the construction of modernist super blocks and sprawling low-density suburbs. Much of Jacob's concern rested on her belief that the changes were resulting in a loss of human vitality and diversity of appeal in the urban setting and that as a result urban areas could become dangerous and isolating places to be (Freeman, 2001).

Some commentators were also alarmed that suburban low-density development was consuming such large amounts of land and resources and was pushing human society dangerously close to exceeding the environmental 'limits to growth,' a concept originally formulated by Thomas Robert Mathus in the late 18th and early 19th century and which was then revisited, advanced and repopularised by Paul Ehrlich, particularly in his texts 'The Population Bomb' and 'The Limits to Growth'.

Aesthetic appreciation of rural landscapes was also becoming more important to Americans after the Second World War as average income steadily increased and greater numbers of people than ever before started to look at life as something beyond simply a struggle to meet a series of core needs. People of average income were able to make leisure visits to beautiful rural areas and some, inspired by urban professionals who preached about the damages of sprawl, recognised that rapid land hungry urban development was endangering some of these places. Indeed, in 1970, Joni Mitchell highlighted these concerns when she sang that "they paved paradise and put up a parking lot" (Mitchell, 1970). 27 years later the British comic character Alan Partridge said what some in society would have been thinking about Mitchell's complaint when he commented on the song (Cole, 2012):

> *That was Big Yellow Taxi by Joni Mitchell, a song in which Joni complains they 'Paved paradise to put up a parking lot', a measure which actually would have alleviated traffic congestion on the outskirts of paradise, something which Joni singularly fails to point out, perhaps because it doesn't quite fit in with her blinkered view of the world.*

2.2.8 The ‘third anti-sprawl campaign’

The final ‘anti-sprawl campaign’ that Bruegmann charts is the ‘third’ (Bruegmann, 2006). He describes this as having occurred from the 1970s onwards until the present, mainly in the United States and Europe but also in ‘many other places worldwide’ (Bruegmann, 2006). Indeed as will be made clear later in this chapter there has been sprawl and interest in sprawl all over the world including in developing countries but the extent of academic literature and internationally accessible material from practice on sprawl in developing countries continues to be severely lacking.

Writers who have advanced the ‘third anti-sprawl campaign’ since 2000 include Sallez and Burgi (Sallez and Burgi, 2004), Pumain (Pumain, 2004), Couch and Karecha (Couch and Karecha, 2006), Heng and Malone-Lee (Heng and Malone-Lee, 2010b) and Shin (Shin, 2010).

The reasons for opposing sprawl in this ‘third anti-sprawl movement’ are largely based on the foundations laid in the first and second anti-sprawl movements with the obvious distinction that global warming is now, in the third campaign, a central part of opposition to urban sprawl. An example of the third campaign being based on those that went before it is the current argument that low-density urban sprawl is an expensive way of building a city was founded in the ‘second anti-sprawl campaign’ and has received further attention in the third campaign. In 2010, Williamson (Williamson, 2010) referring to Burchell and Downs’ comprehensive 2000 study of the costs of sprawl, reiterates the higher infrastructure sprawl brings. Burchell and Downs (Williamson, 2010) outline a range of infrastructure costs in which sprawl brings a higher cost than would be associated with a more intensive form of urban development. They include in this the costs of the increased water, sewerage and road infrastructure made necessary by dispersed development. In addition, the costs of electricity provision for housing and other uses are also raised where development is more dispersed (Carruthers, 2002) (Carruthers and Ulfarsson, 2003). Burchell and Downs (Williamson, 2010) also point out that there is a greater cost to providing the whole gamut of public services in areas where there are relatively low numbers of residents per hectare. Finally, Downs (Downs, 2000) describes how:

> *low-density growth also tempts governments to spend too much of their limited resources on building highly visible new infrastructures rather than on the nearly invisible process of properly maintaining older existing ones*

Downs (Downs, 2000)

A large amount of contemporary academic research - part of the ‘third anti-sprawl movement‘ - testifies to the environmental damage that can result when cities grow in a dispersed fashion at low development intensities, e.g. (Torres et al., 2007). This builds upon ideas that were developed in the ‘first anti-sprawl campaign' and to a greater extent the second. There can be explosive destruction of the green areas which surround cities. Losing green areas can mean that sites of special scientific and scenic interest are consumed with potential repercussions for the region's ability to attract visitors and offer leisure opportunities for its residents. The quality and quantity of agricultural output can also be damaged as urban development impinges on a city's rural hinterland (Johnson, 2001). Furthermore, destruction of green areas can contribute to the destruction of the habitats of wild plants and animals, including endangered species (Cieslewicz, 2002). Burchell and Downs (Williamson, 2010) include the cost of green land (which could be used for agricultural production or for reasons of leisure and tourism) being lost to urban uses as one of the financial costs of sprawl.

In many countries around the world systems for delimiting urban peripheral expansion and protecting green areas, such as 'urban growth boundaries' (Johnson, 2001) can be poorly developed and the integrity of these systems can be vulnerable often because the political will and the resources necessary to ensure compliance may be lacking (Payne and Majale, 2004). In such circumstances destruction of green areas can happen extraordinarily quickly. In countries where there is housing built outside the formal planning system green areas can also be exceptionally vulnerable (Torres et al., 2007), especially if this informality expresses itself through low housing densities and dispersed and sprawling growth.

The problems created by sprawl for the individual resident as well as for the city and environment as a whole have been highlighted extensively in contemporary empirical research - again a topic that forms part of the 'third anti-sprawl movement.’ One of the areas in which there can be the greatest pejorative effect on the lives of individuals is mobility and accessibility. Academic discourse in this area since the 1970s has built a more nuanced sense of the damage caused to personal mobilities over and above the fairly abstract opposition to over use of the car which had been developed in the first and second anti-sprawl campaigns. Mainly since the 1990s there has also been extensive investigation of the potential for urban interventions to transform opportunities for walking and cycling. Interestingly, there has also been interest in how more walking and cycling can transform the urban environment in turn.

Much contemporary academic research has found that in sprawling urban environments walking, cycling and public transport become less viable as mobility options. In residential areas with low housing densities, unless there are very large numbers of residents per dwelling, the number of residents per hectare will be relatively low meaning that it may not be financially viable to provide reliable public transport (Chin, 2002) (Camagni et al., 2002). Cieslewicz (Cieslewicz, 2002) relates how urban form developed ‘on the back of the car’ and which is linked hand in hand with car dependent mobility has changed our comprehension of space and time and has dramatically altered our relationship to the areas and communities we live in and pass through. Urban form of this type can also increase the distances which residents typically have to cover in order to travel from their homes to sites where they can access employment and services. Situations such as these can be particularly damaging for mobility in low income communities where rates of car ownership are low. In communities from where it is difficult to access employment and services, residents can become excluded from the economic and social life of the city. Not only can urban citizens find that the level of mobility and accessibility they enjoy is affected by sprawl but research also demonstrates that people can be more likely to be affected by automobile accidents in such urban environments (Frumkin, 2002).

In sprawling urban areas where families' incomes are high enough to permit car ownership, dependence on automobiles for day to day mobility as well as for less common journeys is often very high. In fact, frequently, families' decisions to occupy housing in areas which demonstrate a low-density urban form are based on an assumption that the car can provide for all or almost all of their mobility needs. There has been a great deal of empirical work done to elaborate on the extent of health problems, e.g. (Lumsdon and Mitchell, 1999), (Naess, 2006) and on the breakdown in social networks in communities, e.g. (Gray et al., 2006) that can result from increased car dependence.

As described above many of the arguments of the 'third anti-sprawl campaign' have built upon ideas put forward during the first and second campaigns. However, there are two clear areas where thinking has not built on any significant precedent set in a previous campaign and has taken a quantum leap during the third movement.

First of all, the relationship between social equity and urban form is now covered far more extensively than ever before. There has been increasing focus since the 1970s on how urban planning can help achieve a socially integrated society with particular concern expressed that the poor and sections of ethnic and religious minorities are marginalised by visible 'density divisions' - that there can be a gulf of visible difference between wealthy low-density areas and poorer higher density areas (though clearly not all low-density areas are wealthy and some of the most marginalised and sometimes least visible areas can be low-density). These ideas have received particularly large amounts of academic coverage in the United States and Europe, and especially in the UK.

Secondly, concerns about carbon emissions and global warming are an area of post 1970s anti-sprawl thinking that is completely novel from any precedents set by the first of second 'anti-sprawl campaigns.' There is abundant contemporary academic research linking urban densities, lifestyle behaviour of residents and levels of emissions of greenhouse gases.

2.2.9 The pro-sprawl viewpoint: definitions of urban sprawl and perceptions of how it can be beneficial

Concurrent with the position adopted by this thesis - that looking for ways in which to reduce low density urban sprawl through residential densification is a worthwhile pursuit - this chapter focusses more on the anti-sprawl viewpoint rather than the pro-sprawl or intermediate viewpoints. In the case of this study, initial scoping research identified that urban sprawl was on balance an extremely damaging phenomenon in the Nicaraguan secondary cities that are the focus of the study. It is also the case that the anti-sprawl view is that which receives most attention in contemporary academic literature and so this literature also reflects that balance in the space given to each viewpoint.

Throughout the period of time covered by the three anti-sprawl campaigns and in the parts of the world which have been involved in this debate, academics and practitioners producing material visible internationally who have commented upon current patterns of urban growth have been more likely to decry suburban sprawl, than to support it. However, it is important to acknowledge the existence of a pro-sprawl view in academic debate and in internationally relevant material which has emerged from practice.

As is the case with writers that hold an anti-sprawl view, those that take a pro-sprawl position provide definitions of sprawl that reflect their views. Gordon and Richardson (Gordon and Richardson, 1997) talk of ‘increasingly spread-out metropolitan development’ rather than using the term ‘sprawl’ in order to refer ‘scientifically’ to the phenomenon. They consider that the term ‘sprawl’ carries with it negative connotations of gluttony and excess that have been built up over time and assert that they should be able to put forward ‘spread-out development‘ as a valid development scenario without immediately inciting unreasonable and irrational disapproval. Gordon and Richardson (Gordon and Richardson, 2001) are perhaps the most committed and prominent defenders - or even proponents - of ‘increasingly spread-out metropolitan development’ in academia (Ewing, 1997) (Brooks, 2004) (Bogart, 2006) (Heartfield, 2006) (Hubble, 2006a) (Hubble, 2006c) (Vale and Vale, 2010) (London, 2006).

Those contributing to the pro-sprawl view reject policies aimed at building housing at higher residential densities, a practice which some opposed to it have ironically termed ‘town-cramming.’ It has been argued by ‘pro-sprawlers’ that low urban densities are required in order to ‘future-proof …’ (Vale and Vale, 2010) urban areas and allow them to adapt to any future ‘post-oil scenario.’ They propose that it is particularly important to ensure that enough land is available in and around urban areas to secure in future a locally produced food supply and guarantee space for a local, self-sufficient waste disposal programme. ‘Pro-sprawlers’ argue that the need to ‘plan... for a stable supply of basic resources ... seems to have been forgotten in ... [our] capitalist globalized society’ (Vale and Vale, 2010) particularly by those who push the agenda for increased urban densities.

A high profile historical figure who was particularly vehement in advocating for dispersed low density housing was Frank Lloyd Wright (Wright, 1932) (Hill, 1992). In fact, Wright went as far as to suggest that town and country should not be distinctive environments at all but that they should effectively be merged by developing housing as a single low density continuum at an average of one family house per hectare (Haughton and Hunter, 2003). In his vision employment and services would be integrated into this low density spread and would be accessed by car, for example with average journeys to work being between ten and twenty miles. He believed that this development model would allow people to live closer to nature and would avoid seeing them forced into ‘becoming part of the city herd’ (Haughton and Hunter 2003, p.291). They would have the freedom to develop a dynamic independent spirit which Wright referred to as the ‘nomad hermit’ instinct (Wright 1932 cited in Haughton and Hunter 2003, p.291).

2.2.10 The intermediate viewpoint: definitions of urban sprawl and a desire to be pragmatic about its balance of benefits and disadvantages

Lynch’s book ‘Good city form’ (Lynch, 1984) is widely considered to be a landmark piece of work addressing the issue of how to create ‘user-friendly’ cities. In the work Lynch assumed a fairly relaxed attitude towards the question of what development densities are appropriate for cities. He was prepared to accept that there should be flexibility over what development densities emerge in cities and that a wide variety of different densities are potentially appropriate in different urban scenarios. He summed this up when he said that ‘no good city could ever be total suburbia ... or entirely high-rise’ (Lynch, 1984). Ewing (Ewing, 1997) states that ‘like most planners ... [he] remain[s] convinced that sprawl is undesirable’ but acknowledges that from the anti-sprawl camp there has often been overblown rhetoric which has overstated the ills of sprawl. Ewing through various works has sought to bring what he sees as a sense of balance to the increasingly polarised debate between the anti-sprawl and pro-sprawl camps. Meanwhile, Bruegmann (Bruegmann, 2006) admits that part of his reason for writing the book ‘Sprawl: A Compact History’ was that he wanted to try to rebalance the debate on sprawl, mainly focussing on the United States. He believed at the time that a false belief about urban sprawl was pervading the US psyche. The message seemed to be being sent out that sprawl was increasing rapidly and that residential densities were quickly falling. He argued that it was not in fact the case and his book aimed to dispel some of the misplaced negativity about sprawl by placing it in its full historical and social context.

To the author the intermediate viewpoint on sprawl seems to occupy a logical and pragmatic position. Many of those that adopt this viewpoint broadly believe that a significant amount of sprawl is a bad thing for cities and also broadly subscribe to the notion that where densities are low they should be raised and that higher densities should be promoted for new urban development. There seems to be a belief within those contributing to the intermediate viewpoint that on balance there are better alternatives to sprawl. However, there is also a sense from those that ‘anti-sprawlers’ are too often completely unable and unwilling to acknowledge that low density urban development has any benefits. People occupying the intermediate position on the whole appear to believe that sprawl and low densities have benefits but that on balance too much of it is a bad thing.

2.3 The compact city

If urban sprawl is recognized as one of the key problems of sustainable development, the idea of the ‘compact city, the opposite of urban sprawl, is increasingly seen as a solution to that problem. Here the author explores the literature on that potential solution in order to more fully understand how the concept is defined and what is understood about its applicability in different contexts.

2.3.1 The compact city as a response to sprawl. A variety of models for how to achieve compact urban development

The term ‘compact city’ has become a become a mainstay in contemporary debate about what constitutes sustainable urban environments, sustainable economically, environmentally and socially. Different conceptions of the compact city have been proposed as a way of overcoming sprawl and the damage it causes and achieving a more sustainable form of urban development. However, as will be addressed further on in this section research and debate have almost entirely addressed the subject in economically developed countries. Economically developing parts of the world including Latin America have received scant attention in comparison.

In order to explore the concept of the compact city and the benefits and drawbacks to this approach to urban development it is important to define what a compact city actually is and how models of the compact city propose that higher development densities may be incorporated into such a city.

Heng and Lee (Heng and Malone-Lee, 2010b) provide a rather abstract description of the characteristics they believe compact cities should possess. They reviewed work by Breheny (Breheny, 1997), McLaren (McLaren, 1992) and Newman (Newman, 2000) in an attempt to answer the questions: ‘what is a compact city?’ and ‘what makes a compact city?’ Breheny (Breheny, 1997), McLaren (McLaren, 1992) and Newman (Newman, 2000) have all written extensively about the concept of the compact city and Breheny is particularly well known for his writing on this subject.

From their review work, Heng and Lee (Heng and Malone-Lee, 2010b) concluded that in order to be considered a compact city, an urban area should include the following principle defining features:

> *urban regeneration, revitalisation of town centres, restraint on development in rural areas, higher densities, mixed-use development, public transport, and the concentration of urban development at public transport nodes*
>
> Heng and Lee (Heng and Malone-Lee, 2010b)

In reviewing literature available on the compact city the author has detected a tendency, particularly in academic literature, to refer to ‘the compact city’ as if it were a single universally agreed format. In fact, this is misleading as different authors both within academia and in professional practice put forward numerous different possible manifestations of the compact city. In effect, a range of diverse routes to achieving greater urban compactness have been presented with contrasting implications for urban planning, governance and for society and the environment.

Gordon and Richardson in their work ‘Are compact cities a desirable planning goal?’ (Gordon and Richardson, 1997) focus on density scales and the compact city, describing three noteworthy and contrasting paradigms for how density is related to whether a city is compact or not. The differences between them can be interpreted as differences in the level at which density is measured and discussed. However, they note that these three paradigms are three possibilities among others. First of all, Gordon and Richardson (Gordon and Richardson, 1997) describe the ‘macro approach’ to building a compact city whereby average densities are measured across the extent of an urban area and clearly these average figures should be high for the city to be considered compact. Secondly, there is the ‘micro approach’ in which the focus for achieving higher densities is at the level of the ‘neighbourhood or community’ (Gordon and Richardson, 1997). Finally, they identify the ‘spatial structure approach’ in which the prime importance of ‘downtown or the central city’ (Gordon and Richardson, 1997) is emphasised, an area which is made the prime focus of the city around which all other elements of the city revolve.

Haughton and Hunter (2003) and Breheny (1996) also discuss the varied possible density characteristics of a compact city. The picture they describe is essentially one of there being a series of different visions of how density and compactness are expressed across the extent of a city. Perhaps the most fundamental way in which these visions differ from each other is that some advocate large continuous urban settlements where densities are optimised ‘across the board’ while others promote what Haughton and Hunter (2003, p.293) term ‘concentrated decentralisation’ whereby cities are made up of a ‘series or galaxy’ of multiple medium or even small sized compact communities. In the case of the latter, densities are optimised within each community. The communities are separated from each other by tracts of rural land and connected to each other by transport arteries along which ribbon development is not permitted/encouraged.

2.3.2 The centrality of urban intensification within definitions and models for the compact city and the important role of housing

In the previous section of this chapter an attempt was made to highlight the variety of definitions that exist for what the compact city is and the collection of different models of how the compact city can be achieved. These have been described mainly in academic literature but also to a more limited extent in material from professional practice which has become available internationally. These definitions and models often differ significantly from each other in character, focus or in detail but critically within all of them is the common principle that the intensification of urban development is desirable and that development intensities or densities should be increased if where and when they are low. The essence of these common core goals is ultimately directed towards promoting efficient/more efficient use of land for urban purposes. An additional critical component that is generally recognised within definitions and/or models for the compact city is that intensification must go hand in hand with proper urban containment if these strategies are to succeed in reducing sprawl and lessening the destruction of rural areas surrounding cities.

Housing constitutes a major land use in all urban areas and growth in this sector contributes significantly to urban sprawl in cities around the world. Scoping research conducted as part of this study has detected that this is a significant issue in Nicaraguan secondary cities and this thesis focuses on it. Addressing the role of housing in urban sprawl forms a critical part of the numerous models/paradigms of the compact city. The objective of increasing development intensities which is a central part of all such models/paradigms manifests itself in the area of housing as a requirement to raise housing densities. This involves planning new housing at higher densities than may have been considered appropriate historically. It also involves raising the densities of existing areas of housing through techniques such as infill development or retrofitting of current plots or structures.

An interesting point to consider is to ask what compact city thinking would prescribe for urban environments that are already dense. In his work ‘Designing the city: towards a more sustainable urban form’ Hildebrand Frey (Frey, 1999) proposes one possible approach. He suggests that where there are existing dense urban areas and where there is a need for further urban growth compact urban development could be further advanced through the setting up of multiple secondary compact urban communities peripheral to the existing primary settlement. These secondary communities would be separate and dispersed from the primary urban area but connected through public transport corridors.

2.3.3 Benefits of the compact city approach

Proponents of all of the various models of the compact city believe that by developing at higher housing densities urban areas can avoid the problems associated with low density housing and urban sprawl. For example, compact cities are places which encourage walking, cycling, good public transport and low fuel consumption for transport (Nijkamp and Rienstra, 1996). Such cities provide residents with improved accessibility to a wide range of employment and services (Headicar, 2000). With an increased number of residents per hectare investment in frequent and reliable public transport becomes more financially viable. Development in line with the ideals of the compact city can help urban residents avoid many of the excessive journey times and difficult transport conditions that people are forced to endure in sprawling low density cities between their homes and their places of work and to the sites of other amenities that are associated with (Hall, 2001).

A compact urban form also typically reduces the distances that must be covered by core infrastructure such as roads and water and electricity supply infrastructure. This makes it possible to drastically reduce the cost of infrastructure. Infrastructure can be one of the most expensive part of extending housing provision. Reducing the need for lengthy extensions of lines of core infrastructure when extending housing provision is particularly important in developing countries where the infrastructure costs are often a significant barrier to house building (Carruthers and Ulfarsson, 2003) (Williamson, 2010).

Other benefits of the compact city have also been debated in literature such as the added security brought to streets by the increased number of people walking in a compact city, as well as the fact that urban public spaces may be used more – and therefore possibly better valued and cared for.

Williams (Williams, 2000) describes how intensification of urban development in accordance with compact city thinking results in land being ‘managed in a more sustainable way' (Williams 2000, p.44). She provides examples of where urban densification policies implemented in boroughs of London have very significantly reduced the amount of derelict urban land in the boroughs, utilising this formerly derelict land for new urban functions including helping to meet housing demand. She remarks that such policies have even resulted in the 'less desirable brownfield sites' (Williams 2000, p.44) being used for development.

In addition, recent decades have seen the development of a new and very influential argument in support of compact cities. As awareness about the greenhouse effect and climate change has rapidly improved and the range and depth of data about these phenomena have increased the argument that compact cities can help reduce the greenhouse effect and climate change has developed. Proponents argue that more compact urban development can reduce emissions of greenhouse gases by reducing dependency on motor vehicles and providing opportunities for more energy efficient protection for urban communities from extreme heat and cold.

2.3.4 The compact city in developing countries

There is a plethora of literature, particularly academic, available from developed countries and about developed countries on the compact city and the advantages it can bring. However, there is far less literature available covering the picture in developing countries, in particular dealing with the application or potential application of the compact city concept in developing countries (Burgess, 2000) (Jenks, 2000). Coverage of the situation in Latin America, and particularly in Central America is poor. It has been almost impossible to identify, in academic literature or in internationally visible material from practice, any mention at all of the compact city or its application or potential application in Nicaragua. Within Nicaragua, the subject generally fails to be covered in academic discourse. This is despite the scoping research conducted as part of this study suggesting that the issue is key in Nicaraguan secondary cities.

In terms of academic debate, the starting gun has been fired on the compact city concept in developing countries by the initial forays into the area of a relatively small number of authors working internationally (Harrison, 2001) (Harrison, 2003) (Burgess, 2000) (Todes 2003) (Todes, 1999) (Harrison and Todes, 2001). These are all incipient and fairly light touch examinations of how appropriate the compact city concept can be for the realities encountered in the urban environments of developing countries. Where academics have sought to question the appropriateness this has mostly been on the basis of the existing ‘super-high urban densities’ found in many cities in the developing world - particularly in South and East Asia - and the commonly held belief that these densities should be reduced rather than increased as attempts are made to improve infrastructure and services for the inhabitants of such areas. Interestingly, one criticism of compact city theory is that it is too closely based on the historic model of development found in European cities and it promotes a naively optimistic view of the compact European cities of history (Jenks et al., 1996).

Burgess (2000) identifies the importance of breaking new ground by investigating the relevance of compact city ideas for developing countries. He also highlights that when doing this it is critical to take into account the very significant differences between developing and developed countries - compact city policy until now having been developed mainly with the latter in mind.

2.3.5 The potential application of the compact city in developing countries where low density urban form predominates

There is an incipient and so far very limited area of academic literature which identifies a number of developing countries around the world where urban densities are for the most part very low. These countries are found mainly in Latin America and sub-Saharan Africa and the small amount of existing academic literature which discusses density in these areas largely considers compact city theory particularly appropriate for improving the sustainability and liveability of urban areas in these countries (Burgess 2000) (Harrison 2003). Within this group of countries the nation about which most research has been done is South Africa (Harrison 2003) (Todes 2003) (The City of Cape Town Spatial Planning and Urban Design Department, 2009). Here, the apartheid driven urban planning policies of the past which sought to separate the residential experiences of black and white people have created vast urban sprawls largely made up of low density ethnically homogenous residential areas.

This research aims to address the gap in academic research and debate in Nicaragua related to compact city theory and also aims to contribute to the body of research available about the compact city in developing countries generally.

2.3.6 The compact city and housing densities

As has been previously highlighted, a key shared component found in all of the various models/paradigms for the compact city is the objective that development intensities or densities are increased. Focussing on housing as this study does this clearly means increasing housing densities. In order to permit debate and discussion internationally on the subject of raising housing densities it is clearly helpful if measures of residential density are aligned as closely as possible from one country to another. Although the nuances of methodology used to measure housing densities are always likely to differ from one country or region to another reflecting differences in local conditions, as much convergence as possible is preferable. Where differences are relatively great protocol for 'translating' density figures arrived at in one country/region into the format used in another country or region are required.

It is therefore critical in this study to examine literature available internationally concerning the measurement of housing density. In the following section of this chapter, many of the different measures used internationally for measuring 'physical' built density will be studied with a view to determining which measure(s) is/are most suitable for measuring housing densities in Nicaraguan secondary cities as part of this study. The next chapter covering methodology will deal with the challenge of making recognised measures of density available internationally work in the conditions found in developing countries and in this case in Nicaragua specifically.

2.4 Developing an appreciation for the wider set of factors associated with urban sustainability performance

Thus far, within the literature review we have focussed on urban sprawl, low-density development and the compact city approach to urban development which seeks to improve urban sustainability performance. This section aims to provide a more general picture about what urban sustainability actually is and the factors other than sprawl, density and the compactness or otherwise of urban areas, which have an impact on achieving progress towards it.

2.4.1 What is urban sustainability?

Sustainability as a concept, as in ‘sustainable development’ or specifically in our case ‘sustainable *urban* development’ is a notoriously nebulous and multi-faceted idea (Bell and Morse 2008, Davidson 2010). In its purest sense, urban sustainability looks at the ability of the world’s urban areas to continue operating. Sustainability is normally thought to encompass environmental, social and economic aspects. The battle to stave off climate change and reduce its effects is central to environmental urban sustainability and the ability of the city to ‘continue to operate’ in an environmental sense, without the city collapsing under the weight of the environmental damage it creates (Bulkeley and Betsill 2005). Social sustainability essentially involves creating urban conditions that allow residents to live happily and safely and to have adequate shelter and enough to eat and drink. Key to this is minimising inequality (Chiu 2002, 2003) and insecurity (Bhatti and Dixon 2003). Sustainable economic development in cities involves creating and distributing wealth so that all residents can secure the concrete necessities such as food and housing to have an adequate standard of living (Anand and Sen 2000) and to do this in such a way that it can continue.

One of the greatest challenges of sustainable urban development is that the world’s urban population continues to grow apace, as does the amount of land occupied by urban areas (Meadows, Meadows and Randers 1992). Fig.2.6 shows that global urban population is climbing as inexorably as the total global population, whereas the population in the world’s rural areas is now remaining approximately constant and even starting to reduce. In this situation, for cities to operate with environmental, social and economic considerations in balance becomes more and more difficult.

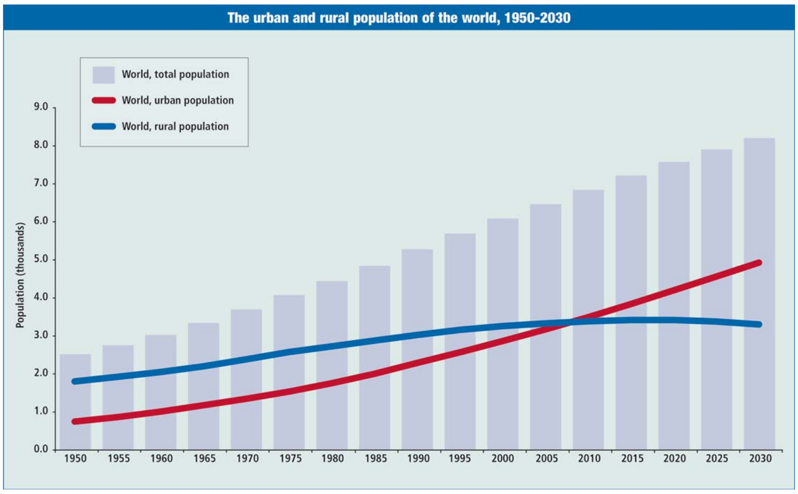

Fig.2.6. Total, rural and urban global population (UN Department of Economic and Social Affairs Population Division 2005)

A second major challenge is that no perfectly sustainable city has ever existed – and indeed, no design for a city has ever perfectly conceptualised total sustainability. As such, in reality, trade-offs must always be made between environmental, social and economic considerations (Adams 2003, Jenks and Jones 2009). A particular urban intervention or policy idea may move use towards sustainability in one sense but move us further away in another. For example, a high-density residential neighbourhood may boast lower per capita energy usage for heating or cooling and for everyday transport than a low-density neighbourhood and therefore would be more considered more sustainable in terms of that particular aspect of environmental sustainability. However, the low-density neighbourhood would likely be better able to offer private outdoor space and the ability to live in detached or semi-detached housing which a global mainstream still consider to be crucial parts of the best social conditions.

Even concentrating fully on environmental aspects of sustainability doesn't avoid the need to balance one consideration over another, with particular models, interventions or policies moving us towards sustainability in one sense and further away in another. For example, as Jenks and Jones (2009, p.6) explain:

> *environmental benefits are claimed to accrue from more compact urban forms where concentration of uses means less need to travel and therefore lower emissions from vehicles*

However, they then go on to state that the advantages described above 'might be outweighed by the loss of open space,' whose practical environmental benefits to urban areas include the following:

> *reduced surface and air temperatures, due to solar shading, free radiation to the night sky and evapotranspiration from trees leading to improved summertime thermal comfort (Vu et al., 1998); a haven from urban pollution and noise (Tyrväinen, 1997); and, buffering against wind reducing wind chills (Lacy, 1977)*

(2009, p.6)

Fig.2.7 shows an attempt to balance higher density urban housing with the provision of urban green space and the practical environmental benefits it brings. The picture shows the exterior of Evelyn Court after its redevelopment. It is described by the architects, who designed the programme of renewal as 'a high-density housing estate' (no page number given). The project has provided a substantial area of grass, interspersed with equipment for childrens' play. Along with the areas of grass, mature trees provide some separation between the housing and the noise and pollution of the road.

Fig.2.7 Evelyn Court in Hackney in east London, redeveloped in 2010 (Whitaker 2010)

2.4.2 Factors influencing urban sustainability performance

As has been noted during this thesis, residential density can affect urban sustainability. However, a myriad of other factors can also affect urban sustainability performance. We will now look at some of the key factors.

2.4.2.1 Factor 1: Political economy and systems for securing the right to land

One of the major factors that can also have a great effect on sustainability is the characteristics of a nation or region's political economy. This is particularly the case with systems for securing the right to land, including how it is owned, leased and whether any reform has taken place or is taking place – for example processes of land registration or titling (Ho and Spoor 2006). This can have a great deal of influence over the density profile of a city and can contribute to determining whether residential densification is possible. These considerations can affect society and place to such an extent that it determines how easy or difficult it is for residential densification to help achieve urban sustainability.

A part of Nicaragua's history, which made it at one point the focus of widespread international political debate was its Revolution, a process of political change, which began with the military defeat of the ruling Somoza family in 1979 and endured for a decade through the 1980s. Political changes in the 1980s were led by the Sandinista political Party, which as a movement had been instrumental in removing the Somoza family from power. These changes have had a seismic and lasting impact on the country's political economy, including on aspects related to land tenure and ownership. Land reform was part of Nicaragua's Revolutionary process and as Ho and Spoor (2006) state land reform is one of the most transformational and defining parts of political revolution and can have the biggest impact on the relative fortunes of different socio-economic groups or classes in society. Internationally, revolutionary land reform has often been focussed on rural/agricultural land but in Nicaragua, land reform had an effect on urban areas (Chavez 1987). Clearly the characteristics of the systems currently in place in Nicaragua for securing the right to land and the changes which took place during the Revolution have a significant impact on whether or not residential densification is possible and the extent to which it can lead to urban sustainability.

The Sandinista Party lost control of national government in 1990, though in 2008 they regained it and continue to have control now. From 1990 until 2008, the country's national government brought in changes so that the national political economic picture began to posses increasingly more elements of capitalist market forces politics. Since 1979, Nicaragua has clearly had a relatively tumultuous political experience and after repeated fundamental changes in political direction anomalies and disputes abound in its political economic system. This is very much the case in the country's systems for securing the right to land.

A crucial consideration when looking at the political economy of any society is whether it has a functioning system for governing the productive use of land. Productivity of land should be a concern both in rural and urban areas. In terms of sustainability, productive use of land should be use that not only benefits the owner of the land but also contributes to the greater good of a community, socially, economically - and of more recent concern, environmentally. The density at which urban land is developed is clearly linked to the level of productivity achieved on the land. However, if productivity of land is a goal is a goal within urban planning, a system of political economy, which facilitates the productive use of land must be in place.

In Principles of Political Economy, one of the most influential works to explore the subject in the 19th century, John Stuart Mill considered land ownership and the productive use of land (Mill 1848). One of Mill's central messages was that land ownership should be considered in very different terms from the ownership of movable objects. Whereas he considered the right of private ownership over movable objects to be absolute, based on the fact that the labour and initiative of the owner, or the person that had sold or passed the object to the owner, had been invested in creating the object, he stated that land in itself had not been created by man but by nature. Therefore, Mill argued that the right to own a piece of land should only be achieved when the owner was investing labour and initiative into using the land productively. If not, then there should be no inherent right for someone to own a piece of the earth's crust to which we are all entitled by common human heritage. On Mill's clause that land ownership should rest on a responsibility to use it productively he states that:

> *[land ownership is] only valid in so far as the proprietor of land is its improver. Whenever, in any country, the proprietor, generally speaking, ceases to be the improver, political economy has nothing to say in defense of landed property*

(p.202)

On Mill's expectation that a land owner should use the land to contribute to the greater good of a community and not for his own personal ends he states that:

a man whom though only one among millions, the law permits to hold thousands of acres as his single share, is not entitled to think that all this is given to him to use and abuse, and deal with as if it concerned nobody but himself.

(p.203)

2.4.2.1.1 Land speculation

Taking Mill's ideas as base, for a political economy to promote the sustainable use of land it should reward the productive use of land – or at least enforce the responsibility to use land in such a way. It should also make land available for people able to foster productive use. In many parts of the world this is not the case. Private landowners speculate on the financial value of land, often for long periods of time, without employing it for any productive use or releasing it to the market. Where such land speculation takes place this violates absolutely Mill's expectation of what a successful political economy should do. In such a situation, landowners are violating Mill's fundamental tenets of land ownership, i.e. the tenet of always striving for a productive use. It should be noted that land banking, where it is done by a public authority for strategic reasons that contribute towards the overall public good, is another matter.

Fig. 2.8 is a photograph taken some time in the late 19th century in an unnamed North American city and shows a sign erected by the owner of the plot of land it stands in front of. It refers to the ideas of Henry George, a writer on matters of political economy who highlighted the problem of land speculation and the unethical and unearned financial rewards it bestowed upon the landowner. He argued that a rise in the value of land was as a result of the time and efforts of an entire community, who apart from the landowner were left uncompensated (George 1884).

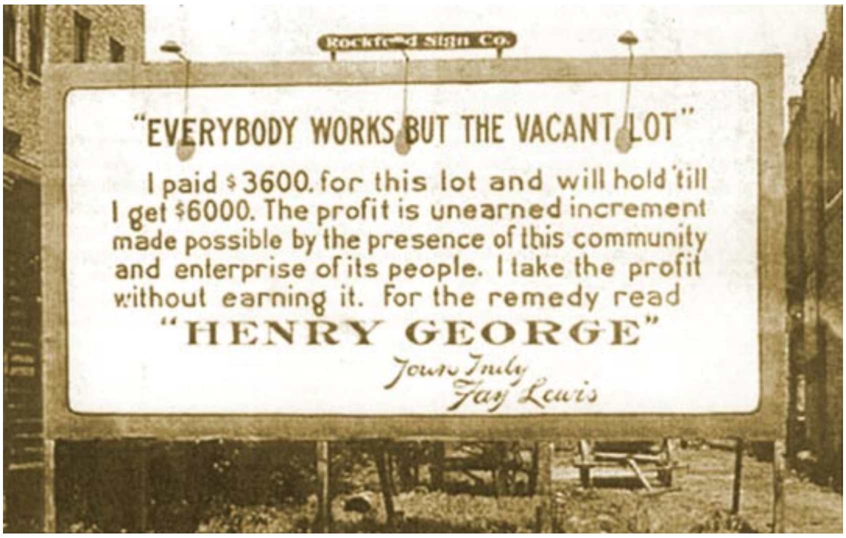

Fig.2.8 (Sign erected in front of a vacant urban plot, Anonymous and date not given)

In an urban area, part of the wider context of using a piece of land productively is that the land contributes in a positive way to the overall sustainability of the city. It may sound far fetched to say that this should ultimately include the responsibility to contribute in a positive way to achieving an overall density profile for the city that is sustainable, socially, economically and environmentally. However, a city's administration should be thinking about how individual pieces of land contribute to the density profile of the city and should regulate land use with such strategies considered.

Lindeman (1976) points out that land speculation prevents land markets from functioning as they ideally would to achieve the most 'economic and efficient use of land' (no page number given). A body of work, which includes Lindeman's work, was produced in the 1960s and 70s which identified land speculation as a major factor in the inefficient use of land in urban areas and the piecemeal, scattered development which led to urban sprawl (Archer 1973, Clawson 1962, Sargent 1976). Land speculation can make residential densification more difficult to achieve by restricting opportunities for infill development. It can also make urban green areas and leisure areas more difficult to provide, as the supply of land is cut generally and such schemes, as the least profitable financially, will be last to happen in a highly speculated market.

Deininger, Zegarra and Lavadenz (2003) identified that land speculation is a major problem in Nicaragua, stating that, based on their studies it is common for:

> *households [to] hold land for non-productive purposes, e.g., for speculation or because of the prestige value that is provided by land ownership [and there are] … considerable imperfections in land sales markets*

In response and influenced by work done by Strasma et al (1987), Deininger, Zegarra and Lavadenz (2003) suggested that:

> *even though it is difficult politically, … taxation of land [could be used] as a possibly more effective instrument to increase the implicit cost of holding land un-productively*

(p.1400)

This leads us to the consideration of possible responses to land speculation and attempts to negate the barrier they create to the productive use of land and ultimately a sustainable land use situation.

2.4.2.1.2 Political responses to land speculation

There has been much written about appropriate political responses to land speculation and reforms to systems of tax are at their heart (Banzhaf and Lavery 2010, Skinner 1991, Wallace and Schwab 1997, Skaburskis and Tomalty 1997). These are useful proposals towards achieving systems that incentivise more productive use of urban land and help to improve urban sustainability. Such proposals may also be capable of establishing urban land use scenarios, which support sustainability in higher density urban environments.

Tax systems for rural or agricultural land have been dealt with significantly but there is literature, which also has relevance for land in urban areas. A key argument is that tax could be levied on land itself rather than on the structures, which are built on the land, so called land taxes. Combined forms of tax have also been proposed, known as split rate taxes, which, under most proposals would involve taxing both land and the structures on the land, but land at a higher rate.

It is argued that land taxes or split rate taxes would incentivise land owners to develop vacant land as opposed to leaving it empty and in addition would incentivise bigger developments over smaller ones and higher density developments over lower density ones. If tax is levied on the value of the structures on a piece of land or – or on the value of their function – then if a landowner wants to minimise the tax they pay it is not in their interest to develop land to house a productive structure or structures or to have a productive function. On the other hand, if tax is levied on land itself rather than the structures on the land, or is levied at a higher rate on land than on the structures, then it is in a landowner’s interest to develop productive structures and uses to cover the costs of the tax charged on the land.

2.4.2.1.3 Land tenure security

In 2005, Broegaard published a paper outlining the results of a study on the state of health of Nicaragua’s system for enforcing land tenure and ownership rights. As a general observation of the situation with these systems in the ‘institutionally unstable setting[s]’ (p.845) found in many developing countries, but based on the experience in Nicaragua, Broegaard highlighted the following problems:

> *inequalities of wealth and power, lack of enforcement and lack of impartiality on the part of the formal institutions when addressing tenure security*

(p.845)

Work by Bruce and Migot-Adholla (1994) and Feder et al. (1988) establish that land tenure security is a critical component of political structures capable of promoting the productive use of land. As established earlier, it is by incentivizing and enforcing the productive use of land that residential densification can be achieved and can contribute to a sustainable urban environment. Bruce and Migot-Adholla (1994) and Feder et al. (1988) identify that a critical effect of tenure security is that it raises levels of investment in the development of land. Their work was focused mainly on agricultural land use but the pattern is also likely to apply in urban contexts.

Supporting the relationship between tenure security and investment, Feder and Feeny (1991) observe that it is only when those occupying land are confident of firm and irrefutable tenure security that they feel incentivized to invest capital and labour in developing the land, secure that they can continue to reap the benefits of their investment, pass on the land to heirs or sell the land. It has also been observed that tenure security makes credit more accessible as securely tenured land can be used as collateral and land that is not securely tenured generally cannot. Such principles are as important to the development of land for urban functions, e.g. housing or commercial activity, as they are to the development of land for agricultural functions.

Broegaard (2005) states that in many countries systems for enforcing land tenure and ownership rights are poorly resourced and lack integrity, transparency and impartiality. This makes possible rent seeking in the area of land and land rights by politically and economically well resourced elites and means such groups are capable of restricting land markets to limited participation so that it is not inclusive of the broad swathe of the population including more marginalized groups. This means whether through informal means or not elites can experience tenure security and can enjoy abundant access to the land market while other groups cannot. This makes land speculation more possible and productive use of land less likely.

2.4.2.2 Factor 2: Outdoor leisure spaces in urban areas

A factor that is critical in creating conditions for urban sustainability is the provision of outside space of a suitable quality in an appropriate location for leisure purposes. There is a significant amount of literature, which explores the link between the provision of outdoor public space in urban areas and sustainability, particularly social sustainability. There is a great deal of agreement that high quality outdoor public space is crucial for creating sustainable cities and also that it makes higher density housing more acceptable to communities (Mitchell 2003; Low, Taplin and Scheld 2009; Force and Rogers 1999; Department of the Environment, Transport and the Regions, London (United Kingdom) 2000). It has also been observed that high quality outdoor public space make higher density cities more attractive to visitors (Low 2010). Nevertheless, Low also raises the idea that significant levels of tourism can interrupt rather than complement the relationship between residents and their local public spaces.

There is less literature exploring the link between outdoor private space, urban sustainability and the social acceptability of higher density living, through there have been some studies. Holden and Norland (2005) studied the travel preferences of people living in different types and locations of housing in the Greater Oslo Region in Norway. The study looked at travel preferences with a view to ultimately exploring the effect of residents' urban environment on their energy use. The study is therefore clearly more focused on environmental rather than social sustainability. A key finding was that people living in 'high density areas' (p.2159) in the city centre or in neighbourhoods next to the city centre, like the Grünerløkka neighbourhood in fig. 2.9, who do not have access to a private garden, travel further and use more energy on travel in their leisure time than people living in lower density accommodation in suburban areas who have access to a private garden. The neighbourhood of Rykkinn was used in the project as a case study and was described by Holden and Norland as 'low density housing located far from the city centre' (p.2159). An example of a dwelling in Rykkinn is given in fig.2.10 The study also found that the opposite is true for non-leisure travel, with those in the higher density areas travelling less and consuming less energy than those in the lower density areas.

Fig. 2.9. The Grünerløkka neighbourhood in Oslo, Norway (Franganillo 2011)

Fig. 2.10. A dwelling in the Rykkinn neighbourhood in Greater Oslo, Norway (Anonymous, date not given)

One possible criticism of the study is that it would be seemingly difficult to isolate the effect of the individual factors of housing density, housing location and access to private outdoor space on residents' travel preferences. Is it possible to have any sense of there being a direct link between a lack of private outdoor space and higher levels of leisure travel, if people living in higher density accommodation in central urban areas may have very different lifestyles from those living in suburban areas, independent of having access to private outdoor space or not? Surely for a resident in higher density accommodation in the city centre without access to a private garden, all three factors combine to create an overall effect on lifestyle.

Of great note is that the Holden and Norland study found that people living in buildings containing multiple dwellings, i.e. flats, who had access to a private garden – even a shared one – demonstrated similar levels of travel and energy use for leisure as people living in detached or semi-detached accommodation. So, having access to a private garden was associated with lower levels of leisure travel, regardless of housing type or whether private gardens were shared or not. Fig. 2.11 provides an example of an urban private garden with shared use, which is not in Oslo. The housing in the image is terraced housing in the Vauban district of Freiburg in Germany. Each dwelling benefits from a private verandah and a private garden, shared with other residents in the terrace.

Fig.2.11. Housing in the Vauban district in Freiburg, Germany (Ely 2011)

In the 2005 paper, Holden and Norland were broadly supportive of higher urban densities being good for urban sustainability. Within this overall framework, their observations on the influence of private outdoor space on sustainability are fascinating.

There are clearly some differences in the relationship between the availability of outdoor space and sustainability between economically developing and more developed countries, and between regions of the world with different climatic conditions. However, literature supporting the direct link between the provision of high quality outdoor leisure space and urban sustainability draws on cases from across the world.

2.4.2.3 Factor 3: Infrastructure and services for mobility

A major factor in determining whether urban sustainability is possible or not, including in higher density compact cities, is the supply of infrastructure and services for mobility. This involves making it possible for people to move for the purposes of work, education, family commitments and leisure. Economic sustainability depends on a city's population and visitors to a city being able to move quickly, safely and in an affordable way for the purposes of work and leisure. Economic success also necessitates the movement of goods and services but we will concentrate here on the movement of people. Social sustainability relies on mobility being accessible and safe for all. Environmental sustainability requires that mobility infrastructure and services produce the lowest levels possible of carbon emissions and other environmental pollutants (Pawlowski 2011).

In addition, it has been widely theorized that infrastructure and services for mobility play a crucial role in making higher density more compact cities possible and allowing them to function sustainably (Williams, Jenks and Burton 2000).

The conurbation of Greater Manchester in north-west England is an example of an urban area which is using massive improvements in mobility infrastructure and services to help lead it towards greater sustainability and to provide a base for higher density, more compact development (Gordon 2008, Transport for Greater Manchester 2015).

Fig. 2.12 is a map of the current state of Greater Manchester's Metrolink tram network. Prior to 2012, only the green, yellow and half of the pink line were in existence. All other lines have been built in recent years and have opened since

2012. This massive expansion, plans for which have long been known as the ‘big bang’ (Tra 2014) has increased the population and the land area within easy reach of a metrolink station. Metrolink services are faster than bus services in the city and provide a more pleasant environment for the traveller. Crucially, the Metrolink system is also owned and regulated by Greater Manchester local governments, whereas private bus companies own the francises to operate bus services in the area, services which are not regulated by government. The local governments, which work closely together through the Association of Greater Manchester Authorities and the Greater Manchester Combined Authority, find that they are able to plan and provide public transport in the city with more coherence and long term strategy using the control they have over Metrolink services as opposed to the relatively small amount of influence they have over bus services (Murray 2013).

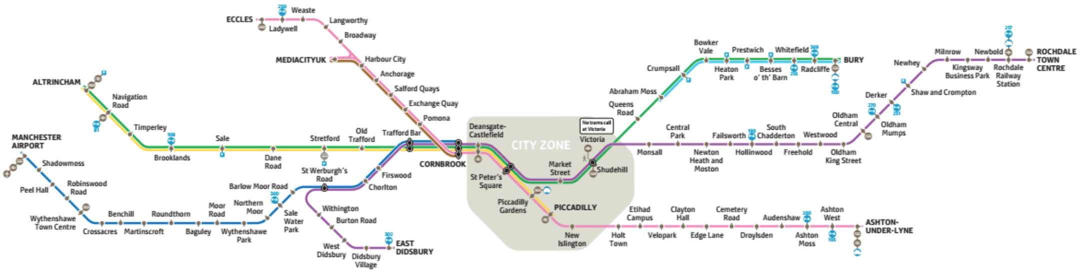

Fig. 2.12. Greater Manchester’s Metrolink tram network (City Metric 2015)

Fig. 2.13 is a map of the cycle network that Greater Manchester hopes to achieve at the completion of its ‘12 year cycling strategy – Vélocity 2025.’ The strategy plans the network of routes on the map made up of sections of cycleway, most of which does not currently exist. A central goal is that as much as possible of the network be segregated from motor traffic (Transport for Greater Manchester 2013).

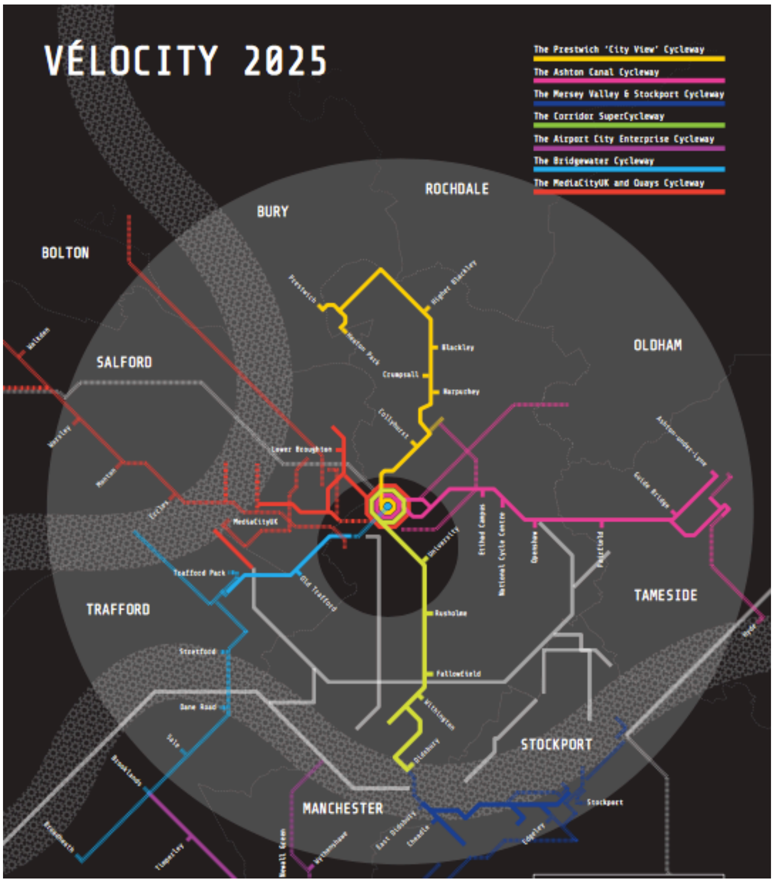

Fig. 2.13. The proposed Vélocity 2025 cycle network for Greater Manchester (Transport for Greater Manchester 2013)

As was mentioned, the Metrolink and Vélocity 2025 changes aim to make the city more sustainable and to facilitate higher density more compact urban morphology (Gordon 2008, Transport for Greater Manchester 2015). Greater Manchester saw much of its most defining and formational growth in the searingly rapid urban development of the industrial revolution. With industrial decline in the latter half of the 20th century, many industrial buildings, often located relatively close to the urban centres of Manchester and surrounding towns, and the residential areas concentrated around them became redundant and were demolished. Meanwhile, investment, where it did happen, occurred mainly outside these areas. This has left Greater Manchester in the 21st century with a great deal of disused brownfield land in areas close to the centres of Manchester and towns like Oldham and Ashton-under-Lyne. Pioneering urban planning by Central Manchester Development Corporation in the late 1980s, until it ceased to exist in 1996 was a stimulus for regeneration of former industrial areas and brownfield development which has grown in scale since then. However, Greater Manchester's urban morphology overall is still relatively dispersed and in many ways incoherent as a legacy of the rush to build during the industrial revolution and the careless decline which ultimately followed (Couch, Petschel-Held and Leontidou (Eds.) 2008, Mancoff and Trela 1996). This means mobility without a car in post-industrial Manchester has often been confusing, inefficient and time consuming.

Many Metrolink stations and sections of the Vélocity 2025 Vision cycle network are located within or close to unused sites that are prime for re-use, whose appropriate development for housing, commercial or other uses can contribute to a more compact city with higher average density. Fig. 2.14 shows Pomona Island a disused former dockside, which is located a short distance from the Pomona Metrolink station and the red Vélocity 2025 cycle route.

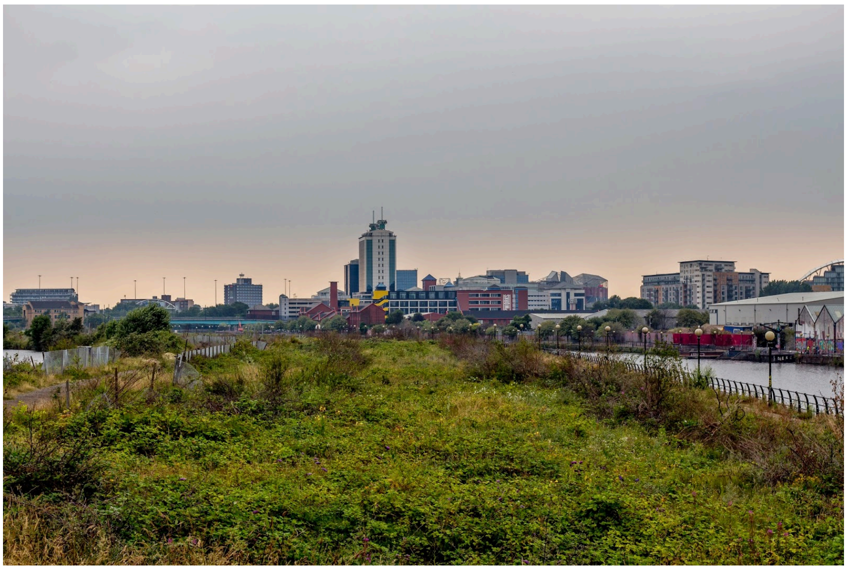

Fig. 2.14. Pomona Island, a disused brownfield site in Manchester, UK (AMagazine 2015).

2.4.2.4 Factor 4: The city's consumption of resources from across the globe

Mainly discussing environmental sustainability and using the tool of ecological footprint analysis, Rees and Wackernagel (1996) make the key point regarding urban sustainability in today's world that 'no city or urban region can achieve sustainability on its own' (p.236). They identify that growing use of technology and dependence on trade in urban areas throughout the world means that each cities now depend upon and influence 'vast and increasingly global hinterland[s].' In fact, trade means that each city exploits 'ecological output and life support functions of distant regions all over the world' (p.236). Rees and Wackernagel (1996) emphasise that without even considering the impact of local policies for urban management if cities are to become more sustainable in a true sense it is critical for there to be more sustainable use of the often distant global hinterlands that they exploit. An intriguing point is made about trade, that it 'reduces the most effective incentive for resource conservation in any import region, the regional population's otherwise dependence on local natural capital' (p.238 and p.239).

Clearly cities have always depended upon a hinterland greater in area than the spatial dimensions of the city itself. However, what has changed is the volume and global reach of a city’s resource use. Modern technology has driven both demand as well as capacity for city dwellers to consume more.

2.5 Housing density and residential densification

Returning to the main focus of this thesis, housing density, it is important to explore issues of residential density and how it is measured if we are to understand how it might interact with the validity of the compact city concept for different contexts.

2.5.1 Measures of housing density

The intensity of built development in a determined area can be calculated by using a number of measures of physical density. In a given scenario, it is important to identify which measure(s) are most suitable for determining housing densities. Focussing on housing as a land use, the measure which best establishes how efficiently land is used for providing dwellings is required if housing densities are to be increased in a planned manner as part of compact city policies. Some measures of physical density allow consideration of the balance between land usage for residential buildings and for local resources and amenities that serve areas of housing such as public green space, schools, health facilities and shops. However, for the purposes of this thesis, only an objective way of representing the density of housing itself is sought.

Of the academic sources identified by the author which discuss the competing measures of physical density available to urban planners, Ann Forsyth of the University of Minnesota’s Design Center for American Urban Landscape (Forsyth,

2003) and Vicky Cheng of the University of Cambridge Department of Architecture (Cheng, 2009) provide by far the most detail. In addition, throughout both of their examinations they mainly focus on housing as their area of primary concern, therefore corresponding with the focus of this study. Forsyth's work comes in the shape of a design brief issued by the Design Center (Forsyth 2003) and Cheng's evaluation forms part of the first chapter in the academic textbook 'Designing high-density cities' (Cheng 2009). In fact, the other academic sources identified by the author which briefly cover some of the various measures of physical density are all academic planning or urban design textbooks (Great Britain Central Housing Advisory Committee, 1944) (Gale, 1949) (Greed and Roberts, 1998) (Roberts and Greed, 2001) (Greed, 2004) - some of which are rather dated. In addition to this, policy documents from planning/housing practice or reports produced by government or professional bodies also cover some of the different measures of physical density in terms of their usefulness for finding housing densities (Town and Country Planning Association, 2003) (Government of South Australia, 2006) (Department for Communities and Local Government, 2011).

In Cheng's work (2009) her central sources are pieces of work by the UK Town and Country Planning Association (Town and Country Planning Association, 2003) and the now defunct UK Office of the Deputy Prime Minister (Minister, 2006). Her reliance on these two sources perhaps reflects the paucity of up-to-date academic literature which succeeds in breaking new ground and making novel observations regarding the ways that measures of density can be used to look at housing. This is certainly borne out by the author's own experience of searching for relevant literature. The organisations that Cheng (2009) refers to here as sources here are governmental and representing professional practice. From what the author of this study has discovered many of the most influential pronouncements on how to measure density come from these types of organisations.

Different measures of ‘physical’ built density differ from each other in three main ways. First of all, they differ in terms of whether they are ‘measures of people density’ (Cheng 2009, p.4) - a simple measure of the numbers of people or units of accommodation etc in a geographical area of a standard size - or whether they characterise how productively or efficiently a specific area of land has been developed - a measure of of building density (Cheng 2009) and in the case of this thesis, because of its focus on housing this means how productively or efficiently a specific area has been developed for housing (Cheng 2009). ‘Measures of people density’ (Cheng 2009, p.4) can be further split up into measures that count the number of people in a defined geographical area (what (Ratcliffe, 1981) terms ‘population density’) or the number of units of accommodation in which people live (e.g. dwellings, habitable rooms etc) that are found in a defined geographical area (Ratcliffe (1981, p.398) terms this ‘accommodation density’). In contrast, ‘measures of building density’ (Cheng 2009, p.5) characterise the relationship between the ‘areas of a building’ (e.g. total floor space or building footprint area) and the total site area of the premises associated with the building (Cheng 2009, p.5). Roberts and Greed 2001 (p.160) consider that only ‘measures of people density’ truly describe the density of urban development found in an area. In contrast, they suggest that ‘measures of building density’ are really best used as a tool for characterising built form as opposed to built density.

Secondly, different measures of ‘physical’ built density used as housing density measurements also differ from each other in terms of the units they use to quantify the ‘bulk measurement of accommodation’ (Government, 1968). Appropriate units can include: dwellings/units, people, habitable rooms, bedrooms or even bed spaces (Greed, 1996) (Government, 1968)

Finally, measurements of physical density differ with regard to the ‘scale of geographical unit’ (Cheng 2009, p.3) to which they refer. For example, the area which any particular measurement refers to could be anything from the total area of a municipality to the site area of a single premises. Internationally, hectares are the units used most commonly as standard for measuring area for the purposes of calculating housing density (Fulford, 1996). In some Latin American countries, including Nicaragua the traditional unit ‘manzana’ is also used for measuring area (Bandiera, 2007), although hectares are also widely understood as a unit of measurement. Rather confusingly the area covered by one manzana changes from one Latin American country to another as the measurement has become imbedded in- and has developed along with - the nuances of local history and tradition. For the purposes of this thesis, hectares are used as units of measurement for geographical area because of their international recognition. All results and discussion will refer to area in hectares. However, those conducting research in Nicaragua should be familiar with manzanas as a unit for measuring area and how to convert between manzanas and hectares.

Academic literature mentions six main ‘measures of people density’ and these differ from each other in some of the ways described above. They are: regional density, overall residential density, occupancy density, occupancy rate, gross residential density and net residential density.

‘Regional density’ (Cheng, 2009) and ‘overall residential density’ (Ratcliffe, 1981) are both an expression of the population density of an entire settlement or region. Both measures are calculated by dividing the total population of the settlement or region by its area. The difference between regional and overall residential density lies in the range of land uses that are included when the area of the settlement or region is calculated. For regional density all land uses (undeveloped and developed land) are included. However, for overall residential density only developed land is included - with ‘developed land’ taken to mean ‘industrial land, all public open space, all schools, and all other types of development’ (Ratcliffe 1981, p.398). ‘Undeveloped or agricultural land’ is thus excluded in the measure of overall residential density (Ratcliffe 1981, p.398). For both measures, the boundaries of municipalities can be used as a reference to assist in defining the area (Ratcliffe 1981).

Both regional density and overall residential density are measures which operate on a relatively large scale in terms of the populations and areas considered. In many urban areas, housing typology is not uniform over such large geographical areas, and so these measures lack accuracy when the aim is to characterise the densities of certain types of housing or specific areas of housing. Neither of the two measures is capable of operating at a small enough scale to find housing densities for the relatively small areas over which housing can be found that is uniform enough to be representative of a single housing typology.

Operating at a much smaller scale than regional density and overall residential density, ‘occupancy density’ (Cheng 2009, p.4) and ‘occupancy rate’ (Cheng 2009, p.4) relate the floor area of a ‘habitable unit’ with its number of occupants (Cheng

2009, p.4). A habitable unit can be any type of public or private building, e.g. commercial or retail property, but most relevant for the purposes of this thesis would be to look at residential units, e.g. a single dwelling or the whole of a multi-dwelling building. Occupancy density is calculated by dividing the number of occupants by the floor area of the habitable unit selected. For housing, this measure demonstrates on a relatively small scale, with specific reference to an individual habitable unit, the 'density of living' achieved by the design of an individual unit - and as a function of how the unit is currently being used. Factors affecting the occupational density of a residential unit include the overall design of the unit, its interior design and the conditions under which it is being used. Occupancy rate is the converse of occupational density: occupancy rate is found by dividing the floor area of a habitable unit by its number of occupants. This measure operates on the same, relatively small scale as occupancy density and similarly places emphasis on the 'density of living' found in the unit. However, it gives a value for the living 'space per occupant' that the unit provides.

Gross residential density and net residential density measure housing density at a spatial scale between that used by the measures of regional density and overall residential density and that used by the measures of occupancy density and occupancy rate. Gross residential density is also known as neighbourhood density. It is used to calculate density for an area which includes the space occupied by housing, any private outside space belonging to the housing, half the width of roads providing access to the housing and any services or amenities which support the community living in the housing (e.g. local parks or schools). Net residential density, also known as site density, is used to calculate density for an area which includes only the space occupied by housing, any private outside space belonging to the housing and half the width of roads providing access to the housing (Greed, 2000) (Town and Country Planning Association, 2003). Gross and net residential density can potentially be used with a range of different units used to represent housing, e.g. dwellings/units, people, habitable rooms, bedrooms or even bed spaces.

After careful analysis net residential density measured in dwellings per hectare (dph) is thought to be the measure which most accurately represents the housing densities of different types of housing or specific areas of housing. This measure will be used for this study. In this study the objective for the density measure used is to measure the number of habitable dwellings per hectare for different types of housing found in Nicaraguan secondary cities. The objective is not, for example, to explore average densities across whole cities or regions or to look at the interior design of dwellings or on the demographic and sociological phenomenon related to the number of people occupying each dwelling. The spatial scale at which the measure of net residential density operates is considered suitable for this study - small enough not to miss the specific areas of housing used as sites for measuring the housing densities of particular types of housing and which are located amid the city regions in question but also the spatial scale is thought to be large enough so that it looks at complete dwelling units rather than focusing on the layouts of their interiors or exactly how families decide to use the interiors. Finally, net residential density is considered a more accurate measure than gross residential density for calculating the densities of specific areas of housing used as sites for measuring the housing densities of particular types of housing. Although, the combination of housing and local services and amenities is undeniably important for the development of sustainable communities, the focus of this thesis is mainly on housing itself rather than on this combination.

2.5.2 Scales of housing density

If housing density measurements are to be collected and used to study patterns of urban development, compare conditions in different regions and help direct urban interventions in the search for more sustainable ways of living, then there must be some sense of what housing density figures actually mean, i.e. what constitutes high, medium and low densities.

During the analysis of literature as part of this study, it was noted that it is remarkably common for authors of academic texts in particular to discuss housing density and refer to high, medium and low densities without ever defining exactly what they mean in quantitative terms. Examples include the work of Hammer et al (Hammer et al., 2004), Hawbaker et al (Hawbaker et al., 2005) and Kretser, Sullivan and Knuth (Kretser et al., 2008). In the opinion of the author, for density and what densities mean to be discussed in any meaningful way it is crucial for academic material and outputs from practice to establish concrete definitions of what is meant when referring to high, medium and low densities. There is enormous potential for confusion when discussing what densities actually mean, not only because scales of what constitutes high, medium and low density are poorly defined but also because the units used to make measurements can vary so much. For example, while some authors may consider it appropriate to define high density housing as that which achieves a density of more than 10,000 people per sq mile other authors may define high density as housing of more than 50 dwellings per hectare. In addition, while certain authors may see low density as being housing achieving less than 50 habitable rooms per manzana others may consider it to be housing of less than 20 dwellings per hectare.

To add to the levels of uncertainty which surround the understanding and discussion of scales of housing density, whether common quantitative values for high, medium and low housing densities are established or not, the sense, imbedded in a society of the kinds of housing that exemplify high, medium or low density can differ radically from one country or region of the world to another (Burgess, 2000).

In the midst of all this subjectivity, a small number of contributors have attempted as far as possible to provide more objective definitions of the gradations of high, medium and low housing density. Greater objectivity is of considerable use when working internationally as the more subjective definitions from individual nations are only ever really capable of representing the conditions and assumptions inherent in those cultures. If international comparisons are to be made and the issue of density discussed across national borders then more objectivity is required.

It was initially the hope of the author that the UK Town and Country Planning Association's 'policy statement [on] residential densities' (Town and Country Planning Association 2003) may help to provide some 'cold hearted impartiality' on density scales to help this study produce insight which could be relevant beyond the confines of Nicaraguan secondary cities. The organisation has, in recent years, produced a number of insightful and well considered policy documents on density and how it is measured. The UK Town and Country Planning Association identifies a housing density figure of 60 dwellings per hectare (dph) as the threshold above which densities are very high and ‘would inflict high social, economic, and environmental costs on communities and create places that appeal only to a small minority of households’ (Town and Country Planning Association 2003, p.4). In addition, the policy statement stated that ‘very low densities, [which it defined as] houses built at less than about 20 per hectare, generally fail to create a recognisably ‘urban’ context for community life’ (Town and Country Planning Association 2003, p.4). Finally, the document identified 30 to 40 dph as ‘the way forward’ (Town and Country Planning Association 2003, p.4). At first look this all seemed reasonable.

In order to test how internationally relevant the UK Town and Country Planning Association’s density scale is, the scale was compared against data and reports on a number of housing case studies from around the world, including examples from different countries which have been written about as models of sustainable development good practice. After careful analysis of the scale in light when applied to the diversity of the international case studies, 60 dph is considered far too low to be offered as an internationally applicable representative figure for high density. Furthermore, although densities below 20 dph are undoubtedly unsustainable and create dispersed urban areas without an urban character, it is the belief of the author after analysis of the range of housing case studies from around the world that these undesirable characteristics are often evident at densities higher than 20 dph. These judgements are reinforced by the author’s own experience of conducting research in cities internationally.

The UK planning consultancy Savills Planning and Regeneration in the baseline report they produced which forms part of the Havant Borough Pre-Submission

Core Strategy (Regeneration, 2010) described the housing to be found in parts of Waterlooville in Hampshire, UK. They described areas of housing whose net residential densities ranged between 17 and 40 dph as ‘suburban in nature’ and stated that the density in these areas was ‘relatively low’ (Savills Planning and Regeneration 2010, p.3). After an analysis of policy documents from different local authorities representing urban areas across the UK, the statements on density made in the Havant Core Strategy seem to be roughly concordant with what the other local authorities are saying about density. The Havant Core Strategy draws heavily on the UK national Planning Policy Statement 3 (PPS3) which is likely to make what the strategy says more representative nationally. In the light of what has been observed from the range of housing case studies from around the world mentioned in the previous paragraph and the pronouncements in the Havant Core Strategy, the ideal density range described by the TCPA (2003, p.4) as ‘the way forward’ - between 30 and 40 dph - seems extremely low. What Munday (Munday, 2002) says on the matter also supports this general view as does the fact that UK housing densities are for the most part quite significantly lower than many other countries within Europe and around the world.

In the opinion of the author, (Fulford, 1996) provides a guide to ‘optimal’ net residential densities which is more applicable internationally. This is because Fulford’s assertions are based on work with a significantly international reach by Newman and Kenworthy (Newman and Kenworthy, 1989) and by Friends of the Earth (for which he gives no reference) to determine the densities required to make specific ways of living which can be compared internationally possible. It is established that public transport and walking are possible at 90-120 people per hectare (pph) and 300 pph respectively and to achieve what Fulford (1996) terms ‘sustainable urban’ and ‘central/accessible urban’ environments densities of 225-300 pph and up to 370 pph respectively are requried (p.130). Whereas the TCPA’s (2003) comments on density are ultimately a reflection of a UK centric approach to housing there is an attempt by Fulford to gather a set of expectations regarding density that are based on more objective reasoning and more closely linked to specific ways of living which are less partial to the nuances of a particular country.

In the opinion of the author, Fulford’s (1996) work on defining optimal net residential densities for use as a guide internationally provides the most comprehensive and considered international contribution yet achieved. However, it is also the author’s view that Fulford’s decision to use both figures for minimum densities - as he does when he states that 300 pph is the minimum density to make walking a viable mobility strategy in a community - and ranges of density values (e.g. 90 - 120 pph for enabling the use of public transport) introduces some confusion and uncertainty into the work. For the purposes of this study, the author will use both Fulford’s figures for minimum densities and his ranges of density values (as well as focussing on the minimum value in those ranges) as indications of the minimum densities required to enable the scenarios he discusses (e.g. walking, public transport use, sustainable urban environment). It is acknowledged that notional upper limits for densities do apply, i.e. although higher densities can improve urban sustainability if densities are excessively high this can bring damaging negative externalities. Nevertheless, in Nicaragua the author’s scoping research has clearly identified that there are not problems with densities being too high but rather there are problems with them being too low. There is also no foreseeable likelihood of excessive densities becoming a problem in Nicaragua. Care must be taken though to ensure that if any attempts to increase residential densities were ever put in place in Nicaragua that the legacy of this is not excessive densities bringing negative externalities.

This study uses dwellings per hectare (dph) as the units with which to measure density. It is therefore necessary to convert the unit of people per hectare (pph) used by Fulford (based on work by Newman and Kenworthy (Newman and Kenworthy, 1989) and Friends of the Earth (no reference given by Fulford)) into dph. In order to convert pph into dph a value for number of inhabitants per dwelling is required. At this point a decision must be made about whether the data on inhabitants per dwelling should describe the situation in developed countries or developing countries and whether the data should describe a number of countries or a single specific country, e.g. the UK or Nicaragua.

Fulford’s work on establishing optimum densities in pph, despite addressing the topic internationally, is based mainly on his experience in developed countries (Fulford, 1996). In addition, Newman and Kenworthy (Newman and Kenworthy, 1989) make it explicitly clear in the work in which they identify optimum densities that developing countries are outside their scope. Finally, it is also clear from the nature of the literature produced by Friends of the Earth on the matter, e.g. (Friends of the Earth, 2011), that their experience and focus regarding urban densities is very much the developed world. In fact, within the ‘family’ of the numerous national Friends of the Earth organisations that exist it is those based in the UK and Australia that have been the most involved in looking at residential densities.

It is the opinion of the author that the figures used to convert pph into dph should continue the trend and scope of the work done by Fulford, Newman and Kenworthy and Friends’ of the Earth. As a result, the data on inhabitants per dwelling should come from work/discourse on developed countries. This is so as to maintain continuity and integrity in this process of defining meaningful density scales. Although this thesis focuses on Nicaragua, a developing country and there is a temptation to seek to contextualise the work of this study as quickly as possible to the country in focus, it is the opinion of the author that in this case a clash of data from two very different contexts would introduce an unacceptable level of discontinuity and unpredictability.

It is also the belief of the author that the data on inhabitants per dwelling used to convert the optimum densities measured in pph into values expressed in dph should be taken from a single country as opposed to a number of countries or from a region larger than a country. Any attempt to use more than a single nations’ figures and, for example calculate their average, would only serve to reach an unrealistic ‘halfway house‘ in terms of data, data which would not be representative of one country or another or one condition or another. The country which is covered most frequently in the combined work of Fulford, Newman and Kenworthy and Friends of the Earth on the topic of urban residential densities is the UK. It is therefore the UK whose data on number of inhabitants per dwelling will be used. The UK national average figure is considered most appropriate as using numerous average figures for different areas of the UK or for different types of housing is considered to be an excessively complex option.

The mean average number of people per household in the UK is 2.4 (Office for National Statistics, 2011). The table in figure 2.15 below shows the optimum net residential densities that were identified by Fulford based on the work by Newman and Kenworthy and Friends of the Earth. In one column, the optimum densities are given in their original pph and in another column they are given in dph (rounded to the nearest whole number), with the UK national number of people per household used to calculate the figures in the latter column.

Optimal net residential density to enable	**Density (in pph)**	**Density in dph (based on mean average UK persons per household)**
Public transport	90 - 120	38 - 50
Walking	300	125
Sustainable urban	225 - 330	94 - 138
Central/accessible urban	Up to 370	Up to 154

Fig. 2.15. Table summarising current international thinking on what constitutes optimum net residential densities for a variety of urban functions

2.5.3 Measuring and discussing housing densities in developing countries

In order to begin to explore the phenomenon of urban sprawl and the potential suitability of the compact city principle in Nicaragua, methodology for measuring housing densities is required, tailored to the conditions found in the country's urban areas and compatible with the types of housing found there. There is no academic literature or material from practice available internationally which describes in detail practical methodology for making housing density measurements in Nicaragua or in any other Latin American country. In addition, very little material is available on this area from or about any countries in the Global South. Material from the Global North describing practical methodology for measuring housing density is readily available but must be adapted for use in Nicaragua or in other countries in Latin America or in the Global South more widely.

It is hoped that in developing methodology for measuring housing density tailored to Nicaraguan urban conditions this study can also contribute to advancing knowledge of how to measure housing densities in the urban areas of the Global South more widely.

2.5.4 The lack of housing density data covering developing countries

Obviously partly as a result of the dearth of academic literature and material from practice available internationally covering methodologies for calculating housing densities in the Global South there is also a clear lack of housing density data - accessible internationally - covering these parts of the world (Burgess, 2000). In addition, with any housing density that is available, there is also often a lack of consistency - in the units used to measure density - from one country to another and also often within the same country.

There may be information and comment available covering some developing countries which help those accessing such material to elucidate very approximate understanding of some of the most common expressions of urban form in those countries. However, detail, reliability and consistent methodology for measuring densities is what is missing. Across, the developing world comprehensive sets of detailed housing density data are severely lacking.

Without having a detailed and reliable picture of current densities it is very difficult to develop visions for future directions in the planning, design and construction of housing. In order to explore the themes of urban sprawl, the compact city and residential densification in developing countries it is necessary to build up the extent and quality of literature and data on residential densities in these countries.

Covering the developed world, there is ample academic literature and much internationally visible material from practice exploring in depth, with examples, the phenomenon of urban sprawl, its causes, negative effects, the density characteristics indicative of urban sprawl and possible ways of overcoming it. In countries across the Global South, these issues have been explored in far less depth and with much less precision in developing countries.

2.5.5 Cross country differences in urban housing densities

As was noted previously, where there is limited information and comment available covering housing densities in some developing countries it can be possible to elucidate a very approximate understanding of some of the most common expressions of urban form in those countries.

In many developing countries, some urban areas have housing densities that are already very high and there is general consensus that what is actually required is to reduce them. These areas suffer from overpopulation (the populations of these neighbourhoods' far outstrips their ability to provide services for the residents). Much more detailed urban housing density data and methodology is still required for these countries as densities still need to be more accurately measured to allow more effective urban planning.

Importantly for this thesis, academic literature has also identified that there is a small group of developing countries where the limited housing density data available reveals that urban housing densities are generally/consistently low or low/medium. There is no literature at all on even the approximate nature of urban housing densities in Nicaragua but the author's own observations suggests that Nicaragua is a member of this small group of developing countries. In other countries within this group, literature (with much of the literature available internationally coming from South Africa) has called for research and debate about how these low or low/medium urban housing densities affect urban sustainability and about whether urban housing densities could be raised in line with the Compact City Approach. Far more detailed urban housing density data and more robust and internationally comparable methodology would be useful in these countries in order to approach/initiate research and debate on the Compact City Approach in this group of countries.

2.5.7 Awareness about housing densities in developing countries

Low-density housing development and its downsides are experienced by developing countries located in regions throughout the world (Bhatta, 2010). However, members of the wider public and even urban planning professionals can sometimes be relatively unaware of the picture of urban densities found in their country and wider issues connected to housing density, i.e. the link between housing densities and incidence of urban sprawl etc.

Urban planning professionals are clearly members of the society of whichever country they live in and their views on density may be influenced more by their conditioning as part of that society than their role as urban planning professional. In particular, how urban planning professionals and the wider public view the acceptability of moves to increase densities in line with compact city thinking can be conditioned by wider societal views on the subject and by the collective national or regional experience of housing density.

The frequency and distribution of low, medium and high densities can vary greatly from one country or region of the world to another and societal views on housing density can of course be greatly influenced by the nature of existing urban form and densities that people see and experience everyday. In practice, people's views of what is acceptable or desirable often vary little from what they are accustomed to. In short, it is a rare individual who can truly think outside of their own societal sphere on these matters (Burgess, 2000). This is obviously particularly true for the huge majority of people in the world's developing countries who rarely get an opportunity to travel outside of their own countries or regions.

Burgess (Burgess, 2000) provides a useful general picture of the nature of housing densities across the world. Recognising these differences can help us appreciate what people in different parts of the world are typically accustomed to seeing and experiencing:

> *In general urban densities are highest in Asia; high in Europe, North Africa and the Middle East; low in Latin America and sub-Saharan Africa and lowest in North America and Australia.*

(no page number given)

As has been previously noted, in some developing countries, medium, high, and even very high density housing is actually quite prevalent. Burgess (2000) highlights in the quote above that this is particularly the case in Asia and to a lesser extent in North Africa and the Middle East. In such countries, people's views on density will be influenced by the fact that they have seen examples of medium, high and possibly very high housing densities in real life. However, it is clearly possible that as a result of their experiences people's attitude towards higher density living may be either positive or negative. The author has been unable to find any academic literature or internationally accessible material from practice in which the link is explored between whether or not people have seen examples of higher densities in real life and whether they view such type of urban living in a positive or negative manner. The nature of this link is likely to change from country to country.

In some countries, 'super-high' residential densities are common (at their highest generally found in specific urban locations in Asia) (Chan et al., 2002) (Forrest et al., 2002) and in these areas overcrowding may be a problem. In many countries, it is often the poorest communities who inhabit 'super-high' housing where it occurs. As a result, high density accommodation may have become linked, at least in the view of some groups in society with some of the characteristics (and some of the stereotypes) which are commonly associated with poor and possibly marginalised communities. In many developing countries (again particularly in Asia, but also in North Africa and the Middle East) historic urban form is of relatively high density and thus establishes some precedent within society for such densities.

In countries with significant amounts of existing high density housing, it can be the case that low residential densities are mainly confined to housing occupied by middle and particularly high income residents (Malaque and Yokohari, 2007) (Schneider and Woodcock, 2008). In many areas of the developing world low density housing is also most closely associated with the relatively recent phenomenon of ‘edge cities’ (Garreau, 1992) and with real estate developers capturing people’s imagination with the concept of a ‘worldclass lifestyle’ - mainly in peripheral areas of cities (Habitat, 2008).

For example, many Indian cities are marked by huge differences in the urban housing densities of different areas (Lata et al., 2001) with serious problems of overcrowding occurring in some low-income high-density areas. It is often modern housing currently being built on the urban periphery of Indian cities which is resulting in the most dramatic examples of low density house building that the country has seen so far (Bhatta, 2009) (Sudhira et al., 2004). Although during British colonial rule some areas of housing for middle and high income groups were built at low densities, for example parts of New Delhi (Kumar, 2000), historical patterns of urban form represented in the ‘old towns’ of current cities display high densities.

In North African cities, there are fairly abundant examples of high density housing (Edwards et al., 2004) (Burgess, 2000) though not very-high or ‘super-high’ density housing. In North Africa, historic urban centres also establish a sense of high-density urban realm in the minds of the population. However, in North Africa, low urban housing densities are also seen throughout the region.

Burgess (2000) describes how sub-Saharan Africa generally exhibits low urban housing densities. However, there are some exceptions to this overall pattern. For example, Kenya has experience of an extremely wide diversity of residential densities. It has areas of housing, particularly those occupied by low income communities, whose housing densities are high - and actually are among the highest in Africa (Noor et al., 2003) (Amis, 1996).

So, in many parts of Asia, North Africa and the Middle East - as well as in Kenya - much of the urban populations of countries will have some experience of medium or high density housing. This means that if urban planning or other organisations put forward proposals for residential densification where existing densities are low, members of the public are likely to have a reasonable idea of what higher density living would involve - although of course depending upon the conditions found in the medium or high density housing that already exists ideas may be favourable or not. In addition, in societies where significant amounts of medium and high density housing already exist common expectations regarding the kind of activities that can reasonably be conducted in a home may be more suited to the realities of higher density living, e.g. no expectations to cook regularly with an open fire or to have large private open spaces to keep animals. As has been said, prior exposure of an individual or a population to high density living may invoke positive or negative feelings towards that mode of housing depending upon how they experience the housing - or how people they know have experienced the housing. In extreme situations, such as where high density accommodation has failed after being affected by natural disasters like earthquakes, the negative aspects of the prior experience are so severe that the possibilities of feeling positive about such densities are irrevocably damaged.

In contrast to the countries and regions described above which experience a mix of housing densities, in some developing regions of the world low density urban housing forms are much more widespread and dominant. In these regions, the dominance of low density urban form is the case for historic as well as modern housing types and also across different income sectors. As Burgess (2000) stated of the developing regions of the world it is only sub-Saharan Africa and Latin

America where on the whole low housing densities really predominate in urban settings. For instance, Briggs and Yeboah, building on work done by McGee (1991 cited in Briggs and Yeboah 2001), describe how it is common across sub-Saharan Africa for urban residents of all income sectors to occupy large housing plots and live in low-rise structures.

Briggs and Yeboah (2001) explore possible reasons for low-density urban form dominating in sub-Saharan Africa, factors which may also be responsible for the pre-eminence of this density profile in Latin America. They suggest that in sub-Saharan Africa there is a mixing of rural and urban lifestyles stemming from substantial rural to urban migration. They claim that in sub-Saharan Africa there is a tradition of rural to urban migrants continuing space-intensive ‘rural’ housing/lifestyle practices in the city.

Within sub-Saharan Africa, Central African cities display particularly widespread low-density urban form. For example, Kinshasa, capital of the Democratic Republic of Congo is a city made up of a baffling arrangement of sprawling low density neighbourhoods, which mainly fails to offer any clear sense of legibility or definition - something which is often achieved in cities through diversity of urban form and/or density. Modern Kinshasa has largely arisen thanks to ‘self-help urbanisation’ (Van Ballegooijen and Rocco, 2013) (Smit, 1979) (Ribbeck, 2007), whereby residents have found themselves responsible for founding new areas of housing or adapting existing areas in which to live. They have achieved this through informal means. This means that residents whose native culture, background and lifestyle experience are imbedded in ‘rurality’ have had a very significant impact on the dimensions of plot and street layout in the neighbourhoods where they establish their new urban homes. Residents' decisions on plot size, street dimensions, separation between neighbouring plots and separation between plots and the street have reflected what they are accustomed to from their rural background. It is in this way that large plots have been created, often separated from neighbouring plots with 'generous' amounts of space. A number of writers (Kreibich, 2010) (Van Ballegooijen and Rocco, 2013) (Smit, 1979) (Ribbeck, 2007) have contributed to building up the picture of how self-help urbanisation in Kinshasa has created myriad sprawling low-density neighbourhoods. However, it is also evident that parts of the city exhibit an inherent structure based on the greater 'spatial formality' of colonial traditions of urban layout. Such inherent structure is in some areas a direct legacy of there having been colonial planning in those areas while in other areas it is because planning techniques inherited from the colonial era have been used by post colonial developers.

Of the various developing regions of the world where low-density urban form predominates, the country about which most academic literature and internationally accessible material from practice exists is South Africa. This situation is likely caused by many of the same factors that other countries experience where low-density urban form is widespread. However, in South Africa there is an additional point. The legacy of apartheid looms large, in determining the characteristics of urban form as in so many areas of society, economy and culture. Under apartheid, the fact that the planning system was influenced to such a great extent by the desire to segregate housing and life for black and white people led, in many cases, to an extremely inefficient use of land.

In discussing the link between rural to urban migration, retention of rural housing and lifestyle practices by migrants and incidence of low-density urban housing it should be noted that much of the world has experienced rural to urban migration but it is cities in sub-Saharan Africa and Latin America where low-density urban form is most prevalent. Why has this happened? It is hypothesised that in sub-Saharan Africa rural to urban migrants have experienced more flexibility than in other parts of the world to influence the housing styles in their destinations. This is not to say that the process of rural to urban migration has been any easier for migrants in sub-Saharan Africa but only that the ways in which they have found or created housing in their urban destinations have been less bound by uniform and structured approaches and have been less dependent on forces other than themselves. In fact, a significant factor creating this 'flexibility' for migrants may be that in sub-Saharan Africa and Latin America there is an even greater lack of strategic intervention in infrastructure and housing from the formal public and private sector provision than in other developing regions of the world, meaning that migrants themselves are more independently responsible for creating housing and communities.

As was established earlier on, there have been far greater levels of academic scrutiny and coverage from within practice, visible internationally, on the compact city in developed countries than has been the case for developing countries. In fact, there has been very limited coverage indeed on developing countries. The coverage has been limited almost completely to developing countries with a diversity of housing densities, i.e. from low to high, where people are generally familiar with examples of high density living. The only developing country where low urban housing densities predominate where the idea of the compact city/more compact urban development alternative has been explored in any depth is South Africa.

2.5.8 Increasing residential densities in developing countries

In theory and based on historical precedent the compact city can be built using one of three main urban planning/construction approaches: through the building of completely new compact towns or cities on greenfield land; by demolishing en masse existing cities/towns or parts of them and planning and constructing new urban areas wholly in line with the principles of one or more of the models of the compact city approach (Breheny, 1996); or through incremental and gradual densification of existing towns or cities (Arrigone, 1995) (Sherlock, 1991). Unsurprisingly, around the world, existing projects to form compact cities overwhelmingly employ the latter approach (Power and Houghton, 2007). Densification, as discussed here, includes all changes to an existing town or city which do not involve demolition of large areas of existing housing. These changes can range from those made at the level of the individual plot to those made by the masterplanning of new compact urban extension areas on greenfield land whose construction extends the existing city.

The term ‘densification’ identified within the final of the three main urban planning/construction approaches for the compact city discussed above refers to a process whereby overall densities in a town or city increase gradually over time. This contrasts with the idea that higher density towns or cities can or should be created very quickly, either through the building of new compact cities on greenfield land or through the demolition of significant areas of existing towns or cities and their replacement with new compact urban areas. Residential densification, as opposed to densification of commercial premises is the focus of this study. It can be achieved through the use of a number of practical strategies. For the most part, academic literature and internationally visible material from practice describing such strategies has been written about developed countries (Burgess 2000). This study focusses on developing parts of the world where low density urban form is dominant. South Africa is the only country of this type where written material available internationally has been compiled which discusses approaches to residential densification (The City of Cape Town Spatial Planning and Urban Design Department, 2009) (Arrigone 1995) (Irurah and Boshoff, 2003). The material from South Africa outlines practical strategies for achieving residential densification in practice.

The material from South Africa talks frequently about bringing about ‘higher density’ development, by which it means new residential development built at a higher density than the traditional norm or in the case of infill development at a higher density than development on surrounding plots. Effectively, the material identifies various methods by which higher density development can be implemented. These methods all fall within the third planning/construction approach to building the compact city identified above, that of densification of existing towns or cities. The methods identified by the material are as follows: higher density development ‘on greenfield sites ... within [a] ... city’s planned growth direction’ (The City of Cape Town Spatial Planning and Urban Design Department, 2009); higher density development on ‘vacant infill sites’ within existing urban areas (p. 6); and densification lot by lot within existing urban areas, on lots which are already developed but where extensions/expansions can be made onto or next to existing structures or where subdivision of structures or lots can occur (The City of Cape Town Spatial Planning and Urban Design Department, 2009). In the latter case, densification can be used to expand living accommodation for a household that is already living on a plot or through subdivision create new living accommodation for an incoming household.

2.6 Secondary cities and their growing importance as centres of population in developing countries with increased demand for housing

Here, the work turns to explore dynamic population growth in secondary cities in developing countries including Nicaragua and strategies of urban dispersal. Urban areas all over the world and particularly in developing countries are experiencing very high rates of population growth. In many developing countries, secondary cities - the largest cities in a country after the primate city or cities - are currently seeing greater rates of population growth than the primate city/cities.

In many cases, dynamic population growth in secondary cities is at least partially due to design as strategies of urban dispersal have been adopted by national governments (Beauchemin and Schoumaker, 2005). Urban dispersal is one of a range of strategy options available to countries which intend to reduce rates of primate city urbanisation. Nevertheless, there is a complete lack of academic literature on the subject of urban dispersal strategy in a Nicaraguan context.

Becker et al (Becker et al., 1994) and Beauchemin and Schoumaker (Beauchemin and Schoumaker, 2005) describe how urban dispersal has been employed in a variety of developing countries as an approach to ‘make destinations other than primate cities attractive to migrants’ (Becker et al 1994, p.122). This is done ostensibly to lessen the problems associated with rapid urbanisation of primate urban areas (Beauchemin and Bocquier, 2004) (Todaro et al., 1997) and to reduce regional inequalities (Richardson, 1981) (Otiso, 2005). An important part of strategies of urban dispersal are measures which encourage development to be focussed in smaller and medium-sized secondary cities (Beauchemin and Schoumaker, 2005).

Although relatively little academic research (Becker et al 1994) and material from practice available internationally has covered urban dispersal strategy compared to other approaches aimed at reducing the rates of primate city urbanisation, such as programmes of rural development, it is widely considered where it has been studied to be an effective and balanced approach (Becker et al 1994). Academic research and material from practice available internationally on urban dispersal strategies is also less comprehensive for developing countries around the world than for developed countries. In Nicaragua, at present, urban dispersal is central to the approach taken by central government to attempt to deal with urbanisation and reduce the pressures of migrants arriving in the capital city Managua.

In some developing countries the significant rates of population growth found in secondary cities are in reality less the result of strategic intervention by government - including that guided by the strategies of urban dispersal - and more the result of varied economic, social and demographic phenomena, such as migrants' search for work and the vagaries of market forces. There are of course, a huge variety of possible reasons imbedded in the economic, social and demographic realities of countries, as to why the populations of secondary cities are growing.

Effective direction in the areas of urban planning and housing is obviously critical to enable government to realise any plans it has to drive demographic change in the country in which it governs.

2.6.1 Housing need in secondary cities in developing countries

The high population growth seen in many secondary cities around the world particularly in developing countries and including in Nicaragua, combined with shortages of housing supply in many of those cities means that secondary cities around the world are experiencing high need for housing. This is especially the case for low and middle income housing sectors. The small size of secondary cities relative to primate cities mean they can be overwhelmed by need for housing and services as they experience high population growth rates (Villa and Rodriguez, 1996) (John, 2012).

2.7. The benefits of local approaches to urban development and international cooperation

The scoping research conducted as part of this study (see chapter 3, Methodology) noted that there is no effective direction from Nicaraguan central government in the area of urban planning and housing. In Nicaragua it is effectively left completely to local government and any local partners to develop and implement plans and projects in these areas. As a result, this research will seek to complete its aim, i.e. explore the potential for achieving residential densification in Nicaraguan secondary cities, by focussing on these local level approaches.

The benefits of planning and carrying out development work at a local level is noted in much academic literature, as is the often critical role that international development cooperation at a local to local level plays in development initiatives in many developing countries.

The United Nations Local Agenda 21 (Nations, 1992) underlines the importance of local government as it is the closest form of government to the people. Meanwhile, a report written by the Ayuntamiento de Sevilla and UN Habitat (Sevilla, 2006a) cites the ‘flexibility, ... capacity for adaption ... and proximity [to the people and the development challenges]’ that local government offers, saying that for these reasons local government should be strengthened as a key player for achieving practical development progress in cities.

Kaul (Kaul, 1998) describes how internationally ‘many governments have decentralized, [therefore] adding municipalities to the group of developmental actors.’ Hafteck (Hafteck, 2003) notes that local government is mostly better positioned to lead local development than local NGOs who are often less experienced at budgeting and planning. In Nicaragua, decentralisation of government has taken place, with ostensibly part of the reason being that it would supposedly put local government in an improved position financially and politically to lead local development (Lindert, 2009). The scoping research conducted as part of this study demonstrated that despite there having been some decentralisation within Nicaraguan government which has brought increased funding and political power to municipal government (Van Lindert 2009), at a local level in the case study cities, urban planning and housing remits are still constrained by a lack of funding, a lack of employee numbers and a lack of decisive political influence.

The scoping research conducted as part of this study has shown that, in Nicaraguan secondary cities, programmes of international cooperation very frequently support local Nicaraguan institutions including municipal government, both in terms of financing and capacity. Montiel and Barten (Montiel and Barten, 1999) describe how, in recent years, international organisations working in Nicaragua have found it more productive to collaborate directly with local government in secondary cities rather than dealing with central government – which has, at times, been so polarised by political divisions that it has been incapable of reaching negotiated decisions or offering effective direction on development matters.

A very major form of international cooperation active in all four of the case study cities in this study is city-to-city cooperation (C2C). C2C partnerships involve the establishment of twin city links between local governments (Bontenbal, 2007) and although such partnerships can in theory occur between local governments from any two countries in the world those that facilitate international development assistance mainly exist between bodies in a developed and a developing country. In such cases, members of staff employed by the local government in the developed country communicate their expertise through visits and remote contact with members of staff employed by the local government in the developing country (Habitat, 2001) (Ayuntamiento de Sevilla and UN Habitat 2006).

Although literature is available on the philosophy of C2C, according to Tjandradewi et al (Tjandradewi et al., 2006), 'surprisingly little research and few evaluations of programmes have been undertaken' discussing the actual work, and critically the 'local institutional' approach, of C2C partnerships internationally. In addition, the majority of the material that does cover C2C addresses its involvement in the area of urban governance. C2C involvement in urban planning and housing seems to have been neglected as an area of study.

A review of C2C literature about Nicaragua reveals that the only empirical data collected on the work or approach of C2C partnerships in the country appears to be that of Marike Bontenbal and Paul Van Lindert (Bontenbal 2007) (Bontenbal, 2008) (Bontenbal and Van Lindert, 2008) (Van Lindert 2008). Bontenbal's PhD thesis explores the urban governance issues concerning four international C2C partnerships, one of which is the partnership between Utrecht, Holland and the Nicaraguan secondary city of León.

2.8 The provision of housing within the formal sector in Central America and Nicaragua: the evolution of a state-private sector dynamic

2.8.1 Influence of Neoliberal policy

In countries throughout Central America over the last half decade the ways in which housing in the formal sector is supplied have changed significantly. The changes have been most marked for housing occupied by middle and low income groups. In the 1960s and 70s, it was common throughout Central America for housing destined for middle and low income residents to be built by the state. However, since the 1980s, countries in Central America have seen the removal of the state from house building and increased reliance on the private sector, international and national cooperation organisations and families themselves for conducting house building operations. Many academic sources have argued that this transformation and its accompanying political and economic changes, which have occurred all over the developing world following from the agenda for change brought by international creditors such as the International Monetary Fund (IMF) and the World Bank, have brought increased uncertainty to the areas of housing provision for middle and low income groups. At the same time, there has been comparatively little upheaval to housing provision for high-income groups which has always been reliant on the private sector - with private companies either contracted directly by wealthy families to manage the design and construction process or with private companies building housing speculatively that is then sold through the private housing market.

Since the 1980s, the World Bank and the IMF (Angel 2000) have spearheaded a change in countries throughout the world in the way that the state and the private sector’s duties are distributed in the area of housing provision. This change has reflected the economic and political philosophy of the neoliberal structural adjustment movement (Sevilla, 2006a). Both the World Bank and the IMF lend money to governments of countries all over the world and both organisations have a huge amount of influence on the strategies those governments use to provide services, including housing, to their people. This is certainly true for countries in Central America including Nicaragua (Bank, 2014) 2009) (Fund, 2014).

The effect of neoliberal political and economic philosophy on how countries work has affected the scope and range of what both central and local government can do to provide housing for middle and low income income groups (Smith, 2005b). In Nicaragua, this has resulted in a significant alteration over time to the role of the local authorities in the four cities on which this study focuses. In Nicaragua, change associated with the structural adjustment movement started in the early 1990s (Dubcovsky, 1999) and change was also at its most marked during that decade.

2.8.2 The change in the role of the state from housing provider to housing enabler

In Central America, major interventions by the state in building housing began in the early 1960s as programmes which notionally had social benefit in mind (Stein and Vance, 2008). Throughout the 1960s and 70s such intervention by the state was fairly commonplace. Schemes were mostly the preserve of central government and saw the state assuming the role of ‘provider of housing solutions’ (Stein and Vance 2008, p. 15). This involved the state performing the range of tasks required for the completion of individual housing projects including providing the necessary land, developing infrastructure and services, building housing units and delivering the completed units to families. In the 1960s and 70s, these schemes often failed to provide accommodation for the poorest urban families largely because of the ‘non-transparent’ (Stein and Vance 2008, p. 14) means by which dwellings were often allocated and the complicated qualifying conditions which were sometimes used. However, such schemes were more successful in providing accommodation for middle income groups in urban areas.

During the 1980s, Central American countries with the exception of Nicaragua felt the effect of IMF and World Bank promoted structural adjustment policies (Booth and Walker, 1999) (Angel 2000). Structural adjustment philosophy prescribed that the role of the state should be as an ‘enabler’ of housing development rather than as a ‘provider of housing solutions’ (Stein and Vance 2008, p. 15). This change saw the state in the countries affected become ‘responsible for setting the norms and regulations and for facilitating core funding, including new forms of subsidies, for the provision of land, basic infrastructure and services’ (Stein and Vance 2008, p. 15). Structural adjustment philosophy envisaged that the state should not be involved directly in house building for any income sector and that the role of house builder should be assumed mostly by private companies operating in the free market and to a limited extent by NGOs (Sevilla, 2006d) (Stein and Vance 2008).

The effect of structural adjustment on the state's role in housing development was felt in Nicaragua mainly from the 1990s onwards (Dubcovsky 1999). Change occurred later in Nicaragua than in other Central American countries because from 1979 to 1990, the country's government was controlled by the Sandinista party who, as part of their aim of 'creating a socialist society' (Gobat, 2005), promoted a dominant role for the state, including on housing and land use planning issues. From 1979 to 1990, the Nicaraguan state continued to make housing interventions as a 'provider of housing solutions' (Stein and Vance 2008, p.15), a role which also continued to include house building. In fact, the socialist state under the Sandinistas pursued this role with much greater vigour than had been the case in the country during the 1960s and 70s. It is also the case that the Sandinistas had a significant amount of success in allocating new dwellings to families who were among Nicaragua's poorest as well as to middle income groups.

In the late 1980s, the Sandinistas found themselves forced to make what Booth and Walker (1999, p.94) call 'structural reforms' or cutbacks to the activity of the state. However, this was an attempt by the Sandinistas to control hyperinflation resulting mainly from expenditure on the contra war and did not represent a change in their core political philosophy. It certainly did not represent any desire to get closer to the neoliberal economic agenda espoused by the IMF and the World Bank (Prevost, 1997) (Booth and Walker 1999) (Spalding, 1994). The extent to which these cutbacks affected the level of state activity involved in housing development continues to be unclear and is a matter of debate.

Nicaragua's Sandinista government experienced an extremely problematic relationship with the 'heavily U.S.-influenced' (Booth and Walker 1999, p.172) IMF and World Bank and this relationship mirrored the antagonism between the Sandinistas and the United States government. The IMF did not issue any loans to Nicaragua from 1979 to 1990 (Spalding 1994) (International Monetary Fund 2014) and the World Bank's loans to the country stopped after the Sandinista's election victory of 1984, not resuming until 1991 (Spalding 1994) (World Bank 2014). As a result, during the 1980s, the exposure of the Nicaraguan house building sector to foreign structural adjustment philosophy was limited.

The Sandinista party lost power in the 1990 national elections, losing control of the presidency to Violeta Chamorro, the candidate representing the UNO coalition of parties opposed to the Sandinista led revolution. The Sandinistas also lost their majority in the National Assembly to the UNO coalition. In the next national elections 6 years later, in 1996, Arnoldo Alemán representing the Liberal Alliance won control of the presidency and his party gained the majority in the National Assembly (Booth and Walker 1999). The period from 1990 to the end of 2001, saw these two governing groups - UNO and the Liberal Alliance - enthusiastically embrace neoliberalism (Robinson, 1997) (Booth and Walker 1999) and IMF/World Bank sponsored structural adjustment. This included Nicaraguan national government adopting changes to housing policy put forward by the structural adjustment related thinking of the time. From this period of time onwards in Nicaragua, the state completely lost the role it had previously occupied as a ‘provider of housing solutions’ (Stein and Vance 2008, p. 15) and took on the restricted role of ‘enabler’ as prescribed by structural adjustment. Since then, the private sector and to a limited extent NGOs have been expected to assume the responsibilities that the state lost. In practice, this has also meant that a significant number of families in Nicaragua, even those operating in the formal housing sector, build their own homes.

Chapter 3. Methodology

3.1 Introduction to the research methodology used in this study

This study is based upon a set of four Nicaraguan case study cities. These are the secondary cities of Granada, León, Masaya and Matagalpa. The research employs a mixed-methods approach. First of all, qualitative methods of data collection and analysis, namely observation, were employed to form a housing typology for Nicaraguan case study cities. Secondly, quantitative methods of data collection and analysis were used to generate housing density data and find average housing densities for the different housing types identified in Nicaraguan case study cities. The main part of the study is comprised of qualitative data collection and analysis operating within the framework of a two stage Delphi method which is used to explore the views of Nicaraguan urban development professionals on urban sprawl, compact urban development, possible methods of residential densification and barriers to residential densification in the case study cities.

Scoping research was used to prepare and refine the focus and the boundaries of the study and consolidate its aims and objectives prior to commencing the main body of the data collection and analysis. Scoping research was used to ensure that the focus and the boundaries of the study were appropriate so that this study explores areas of study which are important on the ground in the case study cities in everyday Nicaraguan reality. The scoping research is also used to ensure that the connection is there between the focus of the study and the current priorities and concerns within policy - hopefully also highlighting important gaps which current policy may have missed. This is important if the work is to be truly policy relevant.

This study employs the case study approach which is regarded as being particularly able to reflect real life conditions (Eckstein, 1992). According to Yin (Punch, 2005), one of the advantages of a Case Study Approach is its ability to 'investigate … a contemporary phenomenon within its real life context.' The case study approach allows data to be obtained on the ground in each case study city. As has been mentioned, this research uses four Nicaraguan secondary cities as case study cities. In this situation, the case study approach provides a way of collecting data city by city to establish overall a housing typology for Nicaraguan secondary cities, measuring corresponding average densities and investigating urban sprawl, the compact city, methods of residential densification and barriers to their implementation. Using the case study approach the richness of data generated by exploring and comparing real life scenarios is brought to bear to study all of the areas of study mentioned. Using four case study cities and a mixed methods approach to data collection and analysis in each one means that the reliability of findings is strengthened as effectively triangulation is achieved.

As mentioned earlier a two stage Delphi method is used to manage much of the qualitative data collection and analysis conducted in this study. The Delphi method is particularly suited to research on the 'distant edges' (Garrod and Fyall, 2005) of current knowledge (Rowe and Wright 1999) (Rowe and Wright, 1999a), where existing information may be lacking and where the only data available is the 'hidden' data held by individuals with experience of the area – known in the Delphi technique as 'experts' (Yong et al., 1989). The 'hidden data' referred to by practitioners of the Delphi method has remained hidden within the minds of the experts until it is released by the Delphi method. Practitioners describe how the Delphi experts are often unaware prior to research taking place that the information they give is of academic value - one reason why it has remained hidden. After conducting scoping research, the author considered that in Nicaragua the areas of study on which it was decided to focus upon are at the 'distant edges' of current knowledge and are concordant with the use of the Delphi method. It is considered that the Delphi method is very appropriate to operate within this study's overall structural approach to information provided by the case study approach.

At this point, where this work lies from an epistemological standpoint will be considered. In other words, how does this thesis intend to 'create knowledge.' Positivism in its most traditional sense carries with it the conviction that the only form of authoritative knowledge is that which is derived directly from physical human senses or from mathematical treatment or from a logical physical scientific process. Positivism is also known as an approach, whose trajectory of knowledge creation goes from a hypothesis developed from existing theory and then seeks to test it (Smith et al., 1996). This in essence involves seeing the world – or at least the part of the world being studied – through a theoretical lens (Hogue, 2015).

Grounded Theory on the other hand, developed by Glaser and Strauss in the 1960s, in a systematic sense is almost the epistemological opposite of positivism. Punch (2005) describes how Grounded theory dictates that the research process should be fully data led and should begin with 'an open mind' rather than an 'up-front theory' to verify (Glaser and Strauss, 1967). There are stages of data collection and analysis which identify ideas, concepts and elements which together ultimately become new theory. As such Grounded Theory is interested in the creation of theory rather than its verification.

In terms of the extent to which this research takes existing theory and seeks to verify it, at different points in the research process this work is informed by elements of both positivism and Grounded Theory. Admittedly, this is a quality shared by much qualitative or mixed methods research. The overall topic of study – residential densities and densification – and the research aims and objectives emerged as a response to the scoping research data, though existing theoretical literature (reviewed in chapter 2) was consulted to help interpret the data and build understanding of the topic, from which aims and objectives could then be formed. In addition, this study involves collecting data in, and analysing data about, a country in which the topic of study has not been covered before and where grounding the research in the data is key to understanding the realities in the field (Blaikie, 1993) – bringing it closer to Grounded Theory.

Grounded Theory has informed work using scoping research in the past and Pettigrew and Roberts (2011) identified the two as being mutually consistent components of the ‘methodological toolbox’ available to researchers.

The Delphi method, used in this study (not for the scoping research) has been associated with use of Grounded Theory in previous research. The Delphi method enables later stages of data collection to be shaped by the outcome of earlier stages, which is clearly very much in line with the evolutionary vision of data aggregation and theory creation presented by Grounded Theory.

As stated previously, the case study approach is used in this study. In previous research Grounded Theory has been used together with the case study approach. Grounded Theory can give case study research the freedom to fully represent the situation on the ground in each of the case study cities rather than it being artificially constrained by attempts to verify a ‘grand theory’ (Gilbert, 2001). Grounded theory is also consistent with the author’s desire for the research data to be obtained on the ground in secondary cities in Nicaragua and for the findings to be grounded in the data (Walker, 1985). In addition, it is hoped that the findings of this study can be policy relevant. The Grounded Theory has been employed in the past with research hoping to do this (Green, 2005).

3.2 A case study research approach is used for the study

This study employs a case study approach to the research. A text outlining many critical issues related to this approach was written by Eckstein (1992). According to Yin (Punch, 2005), one of the advantages of a case study approach is that it provides the ability to ‘investigate … a contemporary phenomenon within its real life context.’ This approach allows data to be obtained on the ground in each case study city.

Theodorson and Theodorson (Punch, 2005) described case studies as a ‘method of studying social phenomena through the analysis of an individual case’ where ‘the case may be a person, a group, an episode, a process, a community, a society, or any other unit of social life.’ In the context of this research, the ‘social phenomena’ studied in each case study city are: urban sprawl and the possible application of compact city thinking including residential densification. Using multiple case studies allows triangulation of the data obtained in order to identify themes in the data and eventually findings (Dooley, 1995).

3.3 Developing a practical approach to the research

3.3.1 Selecting the geographic area of study

The broad area of study of urban planning and/or housing in urban Nicaragua was established from the beginning of the study. However, decisions had to be made about the area of the country to look at. Nicaraguan territory can be broadly separated into two distinct areas distinguished by ethnic, cultural, social and linguistic differences. Pacific and central Nicaragua is inhabited mainly by people who describe themselves as mestizo (a term describing an ethnicity created by mixed indigenous and Spanish ancestry) and who are Spanish speaking. Atlantic (also known as Caribbean) Nicaragua has historically been inhabited mainly by people belonging to the following ethnic groups: black African-Caribbean; Garifuna, an ethnic group created by mixture between a specific indigenous tribal group and people of black African-Caribbean origin; and the indigenous tribal groups of the Caribbean region including the Miskito, the Rama and the Sumo. The languages which have traditionally dominated the Atlantic/Caribbean area of Nicaragua are English and the traditional languages belonging to the various ethnic groups. Historically, there have been low levels of migration between the Pacific/central and the Atlantic/Caribbean areas. Although this has increased since the early 1990s, it remains relatively low. At the time of writing, the ethnic and linguistic groups mentioned maintain their dominance culturally, socially, linguistically and politically in the areas they have traditionally inhabited. Governmental structures that are semi-autonomous from the Nicaraguan national government in the Atlantic

North and South regions permit political self-representation for the people in these parts of Nicaragua.

The limited resources available to this study mean that it is only possible to focus on one of the two distinct areas in Nicaragua described above. The author lived in Pacific/central Nicaragua for 3 years and has significant experience related to that area, including the ability to communicate in Nicaraguan Spanish. The Caribbean half of the country is culturally and linguistically very distinct (Babb, 2001) (Baracco, 2011) and the large majority of Nicaragua's population resides in the Pacific half (*INIDE*, 2005 a). It was decided that the focus of this study should be Pacific and central Nicaragua and not Atlantic Nicaragua.

3.3.2 Scoping research part 1: Selecting the case studies of urban Nicaragua

As has been said, the broad area of study of urban planning and/or housing in urban Nicaragua was established from the beginning of the study. After selecting the geographic area of Nicaragua to look at, the scoping research began with the table below (fig 3.1) which was created to display the populations of the 15 most populated cities in Nicaragua in descending order of population (according to the 2005 Nicaraguan national census – this being the most up to date population data). The cities are all located in Pacific/central Nicaragua.

City	**Urban population of municipality**
Managua	908 892
León	139 433
Chinandega	95 614

Masaya	92 598
Estelí	90 294
Tipitapa	85 948
Matagalpa	80 228
Granada	79 418
Ciuadad Sandino	72 501
Juigalpa	42 763
Jinotega	41 134
El Viejo	39 178
Diriamba	35 222
Chichigalpa	34 243
Ocotal	34 190

Fig. 3.1 Table showing the 15 most populated cities in Nicaragua (INIDE, 2005 b)

When looking for patterns the cities of Tipitapa and Ciudad Sandino were excluded because they are so close to Managua, and can be considered to part of the same conurbation.

It was noted from the table that the capital city Managua is significantly larger in population than all other cities and that there is a group of cities whose populations cluster within a range of 140,000 people to 70,000 people. The cities in this cluster have populations, which are significantly larger than the next cluster of cities population wise. At this point, the cities in this cluster began to be referred to, within this study, as ‘secondary cities.’ Secondary cities are the second tier of cities in terms of population after the primate city or cities in a country. Literature defining the term ‘secondary city’ is reviewed in the literature review.

It was decided at this point that this research would focus on secondary cities in Nicaragua. The critical role that secondary cities play globally in population dynamics and development is covered in the literature review. This group of cities present a fascinating opportunity to study cities in the throes of dynamic population growth.

Incidentally, the urban dispersal strategy (discussed in the literature review) has been adopted in policy at a national level in Nicaragua, which advocates the growth of secondary cities. The rationale is that the cities are developed as alternative migration destinations to the capital city for rural to urban migrants (Gobierno de Nicaragua, 2006). Clearly, the relatively high rates of population growth secondary cities have seen in Nicaragua could be as a result of the dispersal strategy or may have happened independently of this.

Housing demand in Nicaragua's secondary cities is great and is the most pronounced of any urban environment in the country. New nuclear families requiring housing are generated from within the cities’ existing populations and there is also immigration to the cities, mainly from other parts of Nicaragua (Lopez, 1996) (Alcaldía Municipal de Matagalpa, 2004) (Alcaldía Municipal de Masaya, 2005) (La Prensa, 2007).

As a side note, it is worth highlighting that local government in Nicaragua operates exclusively at the level of the municipality. In addition, population census data in Nicaragua - from which population figures and population growth rates are generally calculated - is only available at the level of the nation, the department and the municipality.

In the map in fig 3.2 it can be appreciated that Nicaragua’s secondary cities are distributed in pockets in the north west of the country (Chinandega and León), the northern central part of the country (Estelí and Matagalpa) and in a strip to the south east of Managua (Granada and Masaya). Tipitapa and Ciudad Sandino are excluded from consideration as they are so close to Managua and can be considered to be part of the same conurbation. It was decided that 4 secondary cities would be selected as case studies. This was thought to be the optimum number of case study cities for the study as this achieved the best balance between providing a platform for rigorous and in-depth research and designing a framework going forward which would be achievable given the time and resources available.

Fig. 3.2. Map of Nicaragua (UN Cartographic Section 2015)

The case study cities selected should reflect each of the 3 pockets in the country in which secondary cities are clustered. León and Matagalpa were selected as the cities with the biggest populations in the north western and northern central zones respectively. The strip to the south east of Managua containing Granada and Masaya is the only zone where there is significant daily commuting to and from Managua. Together with Managua this strip forms the commutable unit with by far the largest population in the country. Both Granada and Masaya were selected as case study cities. Selecting both reflected the importance of the strip south east of Managua in terms of population and diurnal population movement. Managua is the country's primate city and its satellite settlements of Ciudad Sandino and Tipitapa are not included as case study cities as they are so close to Managua and part of the same conurbation.

3.3.3 Scoping research part 2: refine the subject focus and subject boundaries of the study

The author lived and worked in the country for 3 years, between 2001 and 2004 and has maintained continued professional contact with the country since then, making various trips to Nicaragua since 2004 and developing a great deal of tacit knowledge on urban planning and housing as well as concerning the geography, culture and society of the country. Fluency in Nicaraguan Spanish also means that the author did not have to use an interpreter/translator for research in the country and could, as a result, get closer to the subject and the participants.

The second part of scoping research, whose purpose was to establish and refine the focus and the boundaries of the study (within the already established general areas of urban planning and housing) and consolidate its aims and objectives, was conducted during the first study trip to Nicaragua as part of this research, in May 2009. The aim of this party of the scoping research was to establish which area of content/which subject area the study would look, rather than the detail of which research philosophies or methods would be used. The research philosophies or methods used were decided based on the outcome of the scoping research – the cities selected and the exact area of study within the general area of urban planning and housing.

Conducting observations (walking around), collected and read key policy documents and plans (maybe present a few quoutations from those docs to show what I chose was an important area as was the cities I chose) and conducted unstructured interviews

In each of the 4 case study cities this part of the scoping research consisted of the 3 forms of data collection. First of all, observations were conducted by the author. Secondly, key policy documents and plans were sought both in person from council offices and online and were skim read to extract the main ideas. Thirdly, 3-4 unstructured interviews were conducted in each city with urban development professionals in key positions in local government. In addition, 3 unstructured interviews were held with academics in the areas of urban planning/urban development and housing at national universities in Managua. Incidentally, the contacts made through these interviews – both directly with those interviewed and with others known to the interviewees (snowballing) helped identify Delphi participants after the scoping research. The purpose of all 3 forms of data collection was to identify key issues/concerns within urban planning and housing which the 4 case study cities shared. Part 2 of the scoping research was less structured than part 1 and also less structured then the data collection which was to come after it as which formed the main part of this research. The analysis of the data consisted of the author reading the observation notes and the documents obtained and listening to audio recordings of the unstructured interviews and reading notes taken during the interviews (transcripts were not made). The author identified a list of key issues/concerns that emerged from the data. These are described below.

Analysis of the scoping research generated a number of relevant findings - key themes to emerge within the areas of urban planning and housing in Nicaragua and which together started to form a direction for research. Critical among these key themes was that progress in Nicaragua in the area of urban planning and housing is hugely restricted by poor institutional capacity, a lack of resources and a dearth of research on these areas. It was also identified that one of the principal urban challenges in Nicaragua is low-density urban sprawl which is widespread. Many of Nicaragua's urban planning professionals are concerned about this issue.

Based on this, it was decided that this study would focus on urban sprawl and on exploring how appropriate compact urban development would be to reduce urban sprawl and its effects, focussing specifically on residential densification.

These topics were considered worthy of study in Nicaragua as they corresponded with gaps in existing academic literature/data, and it was thought that filling those gaps would be of benefit to the country.

In addition, the findings of the scoping research identified that there is no adequate direction in the areas of urban planning and housing from central government in Nicaragua. Currently, progress in these areas is only made through initiatives developed at a local level involving municipal government and often supported by international development assistance, particularly the type of assistance known as city-to-city cooperation (C2C). In response to this, it was decided that this study would focus on the local level in terms of developing a setting for the institutional framework for the research.

Finally, the scoping research found that in Nicaragua’s secondary cities there were already numerous grand plans for large-scale urban planning/housing interventions by local government - often developed off the back of C2C partnerships. At the time of doing the scoping research, none of these plans, described in great detail in policy documents and plans, had been completed and many had not been started at all. In response it was decided that this research would follow the premise of ‘pragmatic incrementalism,’ whose central message is that numerous, small, pragmatic steps can be an incredibly powerful and effective way to make changes to society. This is of particularly relevance when institutions from whom input is required for research may be hesitant to give information and/or when there is a precedent of ‘grand plans’ not succeeding to bring about change.

It was also detected from looking at the policy documents and plans and comparing them with documents on Managua that the case study cities generally had more acute housing need than Managua.

See p.170-184 for a more detailed discussion of secondary data on population growth and housing need in the case studies.

3.3.4. Mixed methods research method

Data is collected and analysed in this study via mixed methods methodology (Giddings, 2006). For the purposes of this study, this consists of a number of stages. First of all, a qualitative method of data collection, namely observation, followed by qualitative analysis of the written observation data through coding, was employed to generate the first set of findings, which emerge from this study. This was in the form of a housing typology for Nicaraguan case study cities. Such a typology has not existed before this study. The next stage of the data collection and analysis was structured around the findings from the first stage. Data analysis is an on-going process in this study with some parts of the data collection following others and some parts of the data collection parallel to others.

The next stage of data collection and analysis involved using quantitative methods to generate another set of original findings, in the form of housing density figures for the different housing types found in the case study cities and identified in the first stage of data collection and analysis. Identifying the housing types with the corresponding density data was a necessary stage in order to set up the next, and main, part of the data collection and analysis where the views of Nicaraguan urban development professionals on the topics of urban sprawl, compact urban development, possible methods of residential densification and barriers to residential densification in the case study cities are explored. The density figures consist of raw quantitative data (housing density readings for test sites representing the different housing types in the different case study cities) and average densities calculated using these figures for each housing type. In addition, the same quantitative methods were used to gather raw density data and calculate average housing densities for national examples of higher density urban housing found outside the case study cities. In each instance, as well as being used to calculate average densities raw density data was also used to produce graphs and other figures which permitted the density data to be presented in varied accessible ways.

The next and main part of the data collection and analysis involves qualitative data collection and analysis operating within the structure of a two stage Delphi technique. This part of the study explores the views of Nicaraguan urban development professionals on the topics of urban sprawl, compact urban development, possible methods of residential densification and barriers to residential densification in the case study cities. The two stage Delphi technique in this study consists of two questionnaires - the term questionnaire is used because this is the term favoured by academic writers discussing the Delphi technique to refer to each stage of enquiry. In fact, in this study both 'questionnaires,' if they were not part of a Delphi process, could likely be described as semi-structured interviews, because they are each made up of a list of open questions to be delivered to the participants verbally by the author, with the order of delivery flexible and the option of using prompts open to the author. In each stage, the questionnaire questions were made available to the participants prior to the questionnaire being completed and each participant completed each questionnaire with the author individually.

Qualitative rather than quantitative research methodology is more appropriate for the main part of the data collection and analysis in this study because this main part is so exploratory in nature, with an inherent flexibility in the specific focus and boundaries of the research. This flexibility is a response to the extreme lack of existing material on the topic and means important parts of the picture in the case study cities are less likely to be missed. The flexibility of the qualitative approach and its ability to capture wide ranging data is very useful for this study (Punch, 2005) (Savan and Sider, 2003) (Harding and Gabriel, 2004).

The scope of the main part of the data collection and analysis could not, early on in the formation of this study, be reduced to a very specific limited number of quantitatively measurable phenomena, as would have been required by a quantitative methodology for data collection and analysis. In addition, a quantitative methodology would have required the identified quantitatively measurable phenomena to be controlled, varied or measured in a carefully managed way (Suen and Ary, 1989) (Gilbert, 2001).

3.4. Developing a 'philosophy of focus'

In order to discuss the critical 'beliefs,' distinct from the philosophy of research and the shape of the practical approaches to the data collection and analysis, that have had the most impact in shaping this research the term the 'philosophy of focus' has been developed by the author. The term 'philosophy of research' refers to the fundamental way of looking at how the research on which this study is based is conducted. This study looks at the broad subject areas of urban planning and housing. The term 'philosophy of focus' refers to the fundamental way in which the subject areas on which this study is based are looked at or viewed. It is the belief of the author that for an in depth piece of research such as this, it is critically important to fully identify and acknowledge the nature of both the 'philosophy of research' and the 'philosophy of focus' which affect the study.

3.4.1 Part one of the philosophy of focus - looking at urban interventions locally

This study uses a case study approach with four Nicaraguan secondary cities as case studies. The scoping research conducted as part of this study found that there is no effective direction provided by Nicaraguan central government in the areas of urban planning and housing. The scoping research also found that development initiatives in urban planning and housing in urban areas in Nicaragua, particularly outside Managua, are overwhelmingly driven by the local municipal governments of the cities concerned, often supported by international cooperation organisations working directly with the local municipal governments.

This study is shaped by a belief that in Nicaraguan urban areas currently it is most pragmatic to study and work to optimise urban planning and housing development at a local level. The effectiveness of working at a local level towards urban development interventions is noted in international academic literature, including that describing the concept and practice of city to city cooperation (Bontenbal and Van Lindert, 2008) (Seisdedos, 2006).

3.4.2 Part two of the philosophy of focus - pragmatic incrementalism

The scoping research realised at the beginning of this study detected large scale non-implementation of existing plans and policies in the area of urban planning in Nicaragua’s urban areas. Despite the fact that locally led initiatives generally drive what progress there is in urban planing and housing in urban areas in Nicaragua this large scale non-implementation is certainly a major problem for local urban plans and policies. The academic area of ‘policy implementation’ covers these types of challenges and their possible responses.

In response to the current situation in Nicaragua's urban areas with policy impementation, part two of the philosophy of focus shaping this research is to embrace the concept of 'pragmatic incrementalism' which advocates the use of small pragmatic changes to achieve larger change over time. According to the idea of 'pragmatic incrementalism,' the small changes it advocates can together achieve a 'gradual strengthening' (Bryant, 2003) in the depth and distribution of the desired outcomes for greater or longer term change. In practice this means that any urban planning or housing changes or interventions etc which are suggested as result of this study should be pragmatic and incremental.

3.5. Details of research trips to Nicaragua

Trip number	Dates	Research activities
1	Mon 4th May 2009 - Tues 26th May 2009	Scoping research
2	Mon 21st Dec 2010 - Fri 26th Feb 2010	Development of housing typology, identification of test sites for housing density measurements, measurement of housing densities, initial face-to-face meetings with Delphi research participants to inform them about the research project and allow them to see in advance the first stage Delphi questionnaire, completion of the Delphi first stage questionnaires with all research participants

Trip number	Dates	Research activities
3	Mon 3rd Jan 2010 - Fri 4th Feb 2011	Initial face-to-face meetings with all research participants to review with them the feedback from the first stage Delphi questionnaires (the participants were originally sent the feedback from the first Delphi stage by e-mail in May 2010) - during these meetings participants were also given a copy of the second stage Delphi questionnaire to complete for the next face-to-face meeting, further test sites for housing density measurements were identified and housing density measurements were made, second face-to-face meetings on this trip took place with all participants at which they submitted to the researcher their completed questionnaires, initial follow-up visits/phone calls and final follow-up visits were made to participants who had failed to submit their completed questionnaires during the second meeting of this trip, combined feedback from both Delphi stages was sent to participants by e-mail in May 2011

Fig.3.3. Table providing details of the research trips to Nicaragua conducted as part of this study.

3.6 Methodology for establishing a housing typology to represent the existing housing stock in the four case study cities

Over the three weeks between Monday 21st of December 2009 and Friday 8th January 2010 detailed observations were made about the types of housing found in the case study cities. The author spent three full days doing this in each of the four case study cities. This time was devoted only to establishing the housing typology as the later stages of data collection, e.g. housing density measurements and the Delphi questionnaires depended upon first establishing the methodology. During these three weeks, as time progressed and city after city was studied, the clarity and accuracy of the typology gradually became clearer as the observations from all four case study cities were put together.

When making preliminary identification of the different housing types in existence, it was clearly important to ‘reach a consensus’ between the pictures that the different case study cities were presenting. By the end of the three weeks spent observing housing types in the four case study cities a clear picture emerged, representing all four cities in a consensual way.

3.6.1 Making preliminary judgments about housing types in the case study cities from satellite images

The visits to each city began with an analysis of satellite or aerial images of the city obtained from Google Earth. At the time, Google Earth coverage of all of the city of Granada and approximately half of the city of León was only available at very poor resolution making it impossible to distinguish individual buildings. Serendipitously, aerial photographs of Granada and León, taken by plane in 2007 and 2008 respectively for the respective municipal governments were available which showed the entire urban areas of both cities at a very acceptable level of resolution.

For each city, when studying the images, attempts were made to make a preliminary identification of the different housing types found in the city based on how the different areas of the city looked from above. Different areas of the cities had different combinations of certain distinguishing characteristics. It was possible to generate a loose identification of different housing types by looking at the distinct combinations of various distinguishing physical characteristics that different areas of the cities demonstrated.

The different distinguishing physical characteristics that different areas of housing had and which could be viewed in the images were as follows. The first group of distinguishing physical characteristics concerned housing form. Different areas of the cities demonstrated different housing form that could be approximately determined from satellites images. Some areas of housing were arranged around courtyards, some were made up of smaller detached building units likely consisting of single dwellings and some consisted of larger detached building units arranged in a linear fashion and which it could be approximately deduced from the images were separated in some areas into two semi detached dwellings and in some areas were separated into multiple terraced or even back-to-back dwellings. The main ways of identifying what were likely to be individual dwellings in the same building unit was looking for different types of roofs (appearance, material, state of repair) or different enclosed plots of land associated with the different dwellings. Secondly, how far areas of housing were from the city centre could be easily and accurately determined from the satellite images. This allowed housing to be characterised as ‘centrally located housing‘ or ‘ housing located on the urban periphery.’ Thirdly, the approximate age of the housing (at least in terms of historical epoch) could often be determined based on the housing form, the nature of the street layout around which the housing was arranged and how far the housing was from the city centre. For example, in the case study cities colonial style historic housing is generally arranged in courtyards using the traditional Spanish colonial grid like street layout and is found relatively close to city centres. In contrast, modern detached low-income housing (built since the 1970s and particularly after the revolution in 1979, often by government and/or through international cooperation) is generally arranged around a street layout which is markedly less faithful to the pattern of straight lines and 90° angles of the traditional colonial grid like layout and is located further from city centres.

Finally, based on the combination of housing form e.g. courtyard, detached, terraced, back to back etc, the distance of housing from the city centre, approximate age of the housing, the nature of the street layout around which housing is found and the size of housing plots determinations can be made about the likely income level of the families occupying the housing. Generally in Nicaraguan cities, the distance of an area of housing from a city centre cannot reliably be used as a simple guide to predicting the likely income level of occupant families. Nicaraguan cities are often extremely mixed in terms of the location of higher and lower income housing, with low income housing often found situated ‘cheek by jowl’ with high income housing.

3.6.2 Making judgements about housing types in the case study cities from observations of the cities while walking along planned routes through them

In each case study city, after loose preliminary exploration of the different housing types found in the case study city by using satellite images and aerial images, the majority of the three days spent in each case study city was used to observe the housing in the city on foot. The author walked through each city following a series of parallel lines on streets as close as possible to 500m apart.

For each city, a single image of the entire city was printed out from Google Earth or from the aerial images provided by municipal authorities and lines were drawn on the map which the author would follow. The lines were drawn on the map prior to walking and were drawn so that they followed streets or pathways which the author determined to be accessible from the images (where possible the images were zoomed in in order to better determine if routes were accessible on foot but the routes were only drawn on to the single map printed to include the whole city in one image).

In order to make a definitive decision about where each parallel walking route would start and finish before any parallel lines were drawn, a city boundary line was delineated on the printed map. Drawing this line involved making judgements about where the city ‘finished’ and where the dispersed settlements of the neighbouring rural hinterlands started. In Nicaragua it is common for low-density but characteristically urban informal settlements to be present in peripheral areas of cities. In each city, such areas, as well as formal planned urban extensions to the city were contained within the city boundary line.

Attempts were made to make the parallel routes as close as possible to 500 m apart. Each parallel route finished at its top and bottom where the image of the city indicated that the edge of the city had been absolutely reached. In order to join adjacent parallel lines into a single continuous walking route, where the end of a line was reached the route continued via the city boundary line until the adjacent line was reached (again the city boundary was followed as closely as possible pedestrian accessibility permitting). Although in many countries in the world the sheer size of cities would make the techniques described here impossible for an individual person with limited amounts of time, in Nicaragua secondary cities are of limited size and such a venture is manageable.

The author followed the routes for each city along the various parallel lines and via the city boundary on foot and carrying a notebook and pen as well as a camera and a dictaphone. The walking was done by the author alone, so as to allow complete concentration on the observation, and at a slow enough pace to allow adequate observation of the areas of housing being passed through. Notes about the character of the housing encountered were recorded on the dictaphone and in a small number of cases accompanying sketch maps were drawn in the notebook. Photographs were taken to illustrate the notes where it was deemed appropriate.

When making the preliminary loose observations using the satellite or aerial images it was only possible to distinguish between different housing types based on a limited set of ‘distinguishing characteristics.’ When following the walking routes and making on the ground observations it was possible to observe a greater number of distinguishing characteristics in greater detail. The additional distinguishing characteristics observed in housing when walking were as follows. First of all, it could be determined whether in areas of housing there had been ‘significant subdivision,’ ‘no significant subdivision’ or ‘no subdivision at all’ of housing plots or structures. ‘Subdivision’ in this case refers to the process of forming two or more properties from a single property. Secondly, it could be observed whether or not an area of housing was part of a ‘social housing project’ (where housing structures are built by government - possibly using international cooperation - or by NGOs). Thirdly, it could also be ascertained whether or not an area of housing constituted one of the few examples of ‘higher density housing’ found in Nicaragua (such examples number approximately 10 to 15 in the entire country). Finally, from on the ground observation it could be deduced whether or not an area of housing demonstrated a very high level of informality (it is inaccurate in Nicaragua, as it is in many developing countries, to say that areas of housing are either completely ‘formal‘ or completely ‘ informal’).

3.7 Making measurements of net residential density in dwellings per hectare for test sites representing the different housing types found in the case study cities

3.7.1 Selecting test sites in the different case study cities to represent the different housing types

Test sites were sought for areas of housing which represented each of the housing types established. Test sites were identified in each of the four case study cities for each housing type. However, no requirement for a standard number of test sites for each housing type was set. This is because the availability and safe accessibility of test sites were very different from one housing type to another and from one case study city to another. Housing density measurements for some housing types in some case study cities presented particular security concerns while measurements for other types in other case study cities were made very difficult by extreme terrain or very high levels of informality. In addition, no requirement was set restricting exactly where in the case study cities test sites should be located or stating that test sites representing a particular housing type must be located in the same part of a city. Test sites which were a good representation of a type and which were accessible were enthusiastically used where found.

3.8 Measuring the area of a test site

3.8.1 Defining the boundaries of a test site in order to measure its area

The measure of net residential housing density requires that when the area of a test site is calculated only the land occupied directly by dwellings is included. This is considered to include the land occupied by housing structures themselves as well as any private outdoor space belonging to the dwellings such as gardens or yards. In addition, the space occupied by half of the width of any roads offering direct accessibility to dwellings is also included (Keeble, 1969) (Roberts, 1974) (Greed, 1996).

3.8.2 Using Google Earth satellite images, aerial photographs or AutoCAD maps to measure the area of a test site

Where Google Earth satellite images were available with sufficient resolution to measure the area of test sites they were the preferred resource for area measurement. Google Earth has a suite of tools available which make area measurement less time consuming and more accurate than the other resources available. In addition, within the Google Earth software, accurate measurement of distances is possible regardless of how much the images of the case study city are zoomed in or out. As was previously mentioned, Google Earth coverage was not of acceptable definition in Granada and half of León. Serendipitously, it was possible to obtain aerial photographs of Granada and León from the respective municipal governments. In addition, in Granada, for some parts of the city accurate to scale AutoCAD maps were available which had been produced in 2006 and updated in 2008 by the municipal government. Unfortunately, different aerial photographs and the AutoCAD material viewed the cities at a wide variety of different scales. This could sometimes make their interpretation confusing and could make accurate distance measurement a very complicated task.

The resolution of Google Earth satellite images covering half of León, Masaya and Matagalpa was sufficient to allow accurate measurement of the area of test sites. For Granada, the AutoCAD Map was considered preferable over the aerial photograph. The AutoCAD map had been created by Granada's municipal government and covered central Granada. Tests conducted by the author showed the AutoCAD map to be accurate and appropriate for measuring distances in the zones it covered. Testing the accuracy of the AutoCAD map involved using it to measure a set of distances (for example, the distance between one corner of a particular housing block and another or the width of the street frontages of different residential properties) and then comparing the figures with those obtained for the same distances but measured with a trundle wheel on the ground.

Developments in the Google Earth software during the course of the data collection and analysis meant that the software was used slightly differently to calculate the area of test sites at different points of the study. The area of test sites identified during the data collection trip to Nicaragua in Jan/Feb 2010 were found using the standard Google Earth software. At that time an upgrade to the Google Earth Pro version of the software was considered too expensive for the costs to be absorbed by the research funding. However, a free trial upgrade to Google Earth Pro was released between the time at which the density calculations were completed based upon the measurements made in the Jan/Feb 2010 data collection trip and the time of the following data collection trip. Standard Google Earth software only allows for straight line measurements to be made of on the ground distances whereas Google Earth Pro features a tool to measure areas of spaces on the ground that are indicated by the user. As a result, the procedures by which the areas of test sites identified during the Jan/Feb 2010 data collection trip were measured were different from the procedures used for test sites identified during the following data collection trip.

3.8.3 Using standard Google Earth software to measure the areas of test sites identified during the Jan/Feb 2010 research trip to Nicaragua

The diagrams in figures 3.4 and 3.5 below show a test site in the city of León as visualised using the standard Google Earth software. This test site will be used here as an example for demonstrating the procedures used to calculate test site area. The blue lines which have been drawn onto the screen demarcate the perimeter of the test site area. There is a tool in the standard Google Earth software package which allows the on the ground distance covered by each of the blue lines to be calculated accurately. As the test sites are mostly not completely regular quadrangles it is not possible to calculate area simply by multiplying the distance covered by the line forming one side of the quadrangle by the distance covered by the line forming another side. In order to calculate the area, the irregular quadrangle must be divided into a number of triangles whose areas can be calculated by multiplying the distance covered by the base of the triangle by the vertical height of the triangle, with this figure then being divided by two. The total area of the irregular quadrangle is then equal to the sum of the areas of the triangles it contains. This series of procedures is demonstrated in the diagrams below.

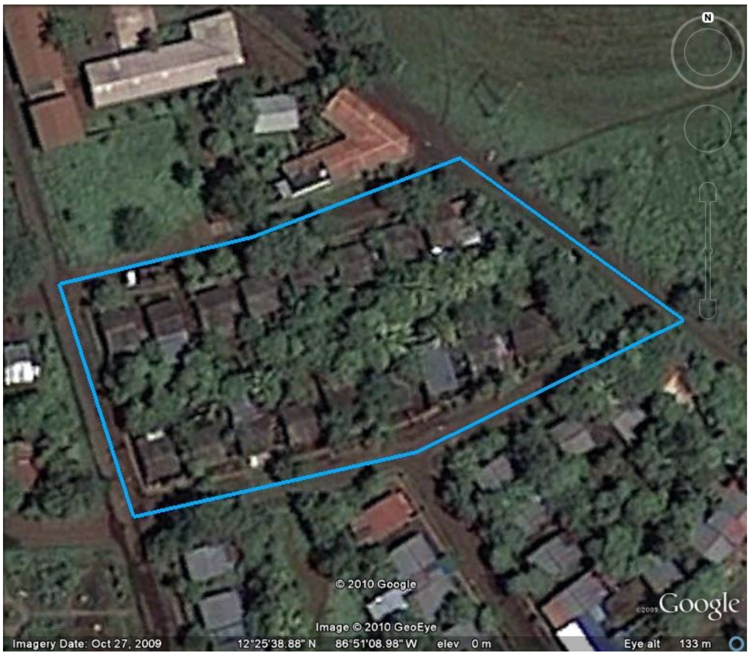

Fig.3.4. Annotated image from the standard Google Earth software package showing the perimeter of a density test area marked in blue. The test site is in the city of León.

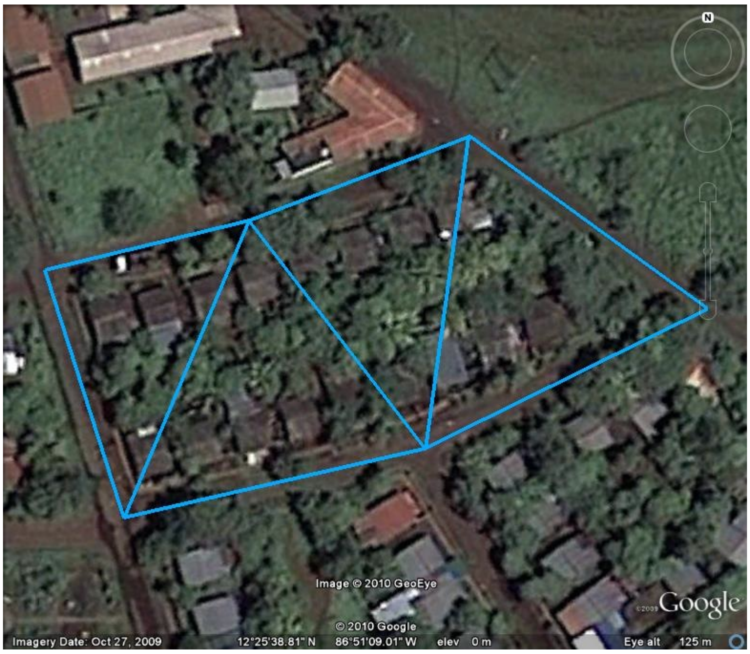

Fig.3.5. Annotated image from the standard Google Earth software package showing the triangles the irregular polygon must be separated into in order to calculate its area.

3.8.4 Using Google Earth Pro software to calculate the areas of test sites identified during the Jan/Feb 2011 research trip to Nicaragua

Within the premium Google Earth Pro software package a tool is available for measuring the area of a space that the user defines by drawing its perimeter. The area of the space defined becomes highlighted in blue and is automatically found using the software, with the perimeter of the space being set by the user.

3.8.5 Measuring the area of test sites where coverage from Google Earth, aerial images or AutoCAD maps is not available

As mentioned, at the time of the density measurements being made, Google Earth coverage was not of sufficient definition for the whole of Granada and for half of the area of León. Most of this gap in provision could be rectified by using aerial photographs or AutoCAD maps available from the municipal governments. However, parts of the periphery of the city of Granada were not covered by either aerial photographs or AutoCAD maps. Unfortunately, the parts of Granada with no provision included areas where it was deemed necessary to have test sites because of the examples of housing types found there. In order to measure the area of these test sites the only recourse available was to do so manually by measuring the distance of the perimeter of the sites using a trundle wheel. First of all, in each case an initial walk around the test site was done to establish a perimeter for the site which encompassed only the space occupied by all of the dwellings in the site and their accompanying pieces of private outside space as well as half the width of any roads providing direct access to the housing units. Measurements would then be taken with a trundle wheel of the perimeter and recorded with an approximate sketch of the plan of the site. Shapes whose area could be determined would then be drawn on the sketch within the perimeter of the site which together made up the total area of the site. This method was able to provide an approximation of the area of the site but with far less accuracy than any of the other methods for calculating the area of a site. One reason for possible inaccuracies was that the true shape of the site could not be fully known from ground level without an ‘eye in the sky’ view, e.g. lines or streets which appeared parallel from the ground may not have been so.

3.9 Counting the number of dwellings in a test site

For net residential density to be measured the number of housing units in a test site is divided by the area of the test site in hectares. The author conducted the housing unit counts for all of the test sites by walking along the entire length of all roads which provided direct access to housing units in the site and manually counting the total number of housing units. With test sites with particularly high numbers of housing units or where counts were particularly complicated, e.g. In sites with high degrees of informality, the author recorded interim counts while walking around the site. This was to avoid losing track of the count. For each site, sketch maps of the site were also recorded in a notebook, sometimes using printed images of the site from above, e.g. from Google Earth, an aerial image obtained from municipal government or from an AutoCAD map.

One of the key skills that the author relied on while making the housing counts was the ability to distinguish, with neighbouring properties (particularly where they were part of a terrace or back to back arrangement of dwellings or where they were semi-detached), where one housing unit started and another one finished. This skill was obviously critical to achieve accurate counts. Achieving this was more difficult for some Nicaraguan housing types than others. For example, it was relatively simple for test sites where the housing was composed of detached dwelling units planned and built as part of a housing project by government, through formal international cooperation or by an NGO. In these cases, it was generally the case that each detached dwelling had an identical (or extremely similar) form and design and often even an identical exterior colour scheme. For other housing types, it was relatively difficult. For example, for test sites where the housing was of a historic colonial style (arranged around courtyards) or neighbouring dwellings were terraced or arranged back to back it was sometimes difficult to clearly determine where one dwelling started and the neighbouring one finished. The author developed techniques to overcome these difficulties based on tacit knowledge about Nicaraguan housing and the housing observations which had been done to identify the different housing types. For example, in the case study cities neighbouring dwellings are often demarcated from each other as families identify the extent of their own exterior facade by painting it in a particular colour that is different from that of their neighbours. It is also often the case that metalwork such as that forming exterior doors and shutters is of the same style and/or colour in a single property but different from one property to another. Finally, if dwellings are connected to mains electricity then individual dwellings normally have one electricity meter each on their external facade. Failing all of this, it was always possible to speak to the residents of the dwellings concerned.

3.10 Security when conducting data collection on foot in the case study cities

Personal security was an issue when conducting data collection on foot in the case study cities. This was done for the observation of housing in the cities aimed at identifying housing types and for the measurement of housing densities for the test sites representing the different housing types. Steps were taken to minimise the possibility of being robbed and/or physically assaulted while data collection was conducted on foot and to lessen the impact of any robbery or other similar incident should it take place. The possible impact of robberies or similar incidents was considered in terms of potential physical harm, loss of personal possessions and loss of research data.

Most data collection on foot was conducted during daylight hours and was only carried out during hours of darkness where the areas being worked in were known to be safe at night (this was mainly limited to the city centres). In areas where there was a stronger possibility of robbery, not only was research avoided at night but it was also avoided during the ‘twilight hours’ between 17.00 and 18.00 hours, which can be dangerous in Nicaraguan urban areas.

In areas of Nicaraguan cities where there is a higher possibility of robbery or similar incidents, ‘white westerners’ (of which the author is one) can sometimes present a greater target than people who are thought to be local. The author dressed smartly in a shirt, formal trousers and formal shoes when conducting research on foot. This avoided creating the idea that the author was a backpacker/tourist and gave the impression of being a ‘professional visitor’ conducting research or other professional work (and possibly affiliated with Nicaraguan institutions). In the author’s experience, appearing to be a ‘professional visitor’ gives people the impression that there would be a greater set of possible consequences to robbery and/or violence for those considering it.

When walking while conducting data collection on foot in the case study cities, it was important to give the impression of walking with purpose with a strong knowledge of knowing where one was going. Studying maps, writing notes and taking photographs etc had to be done with the minimum of fuss and as subtly as possible. In each case before stopping to do these things a quick 360° visual scan of the area was done to check for potential threats.

Maps, the notebook and pen, the camera, the dictaphone and a bottle of water were all carried in an unremarkable looking plastic bag. The ‘standard backpack’ of the western visitor/tourist in Nicaragua was intentionally avoided because it is generally associated with said westerner carrying valuable items.

In order to minimise the impact of any robbery on the data collection process all data collected was backed up at least once a day. This included backing up all observations spoken into the dictaphone, all photographs and anything written in the notebook. To avoid the need for finding a photocopier in order to back up anything inputted into the notebook digital photographs were taken of all new data in the notebook. Dictaphone recordings and all digital photographs (of scenes in the cities or of the content of the notebook) were then easily and quickly backed up onto the author’s laptop (used and stored in a secure indoor location) and onto an external hard drive. The laptop and external hard drive were stored in different locations to minimise the possibility of both going missing.

3.11 Collection of qualitative data using a two stage Delphi process

The Delphi technique, ‘discovered’ by Glaser and Strauss in 1967, refined since then and used for qualitative study in a wide range of disciplines has been particularly successful as a technique for collecting and analysing data in fields of study on the ‘distant edges’ (Garrod and Fyall 2005, p. 86) of current knowledge (Rowe and Wright, 1999b), where existing information may be lacking and where the only data available is the ‘hidden’ data held by individuals with experience of the area – these individuals are known in the Delphi technique as ‘experts’ (Yong et al., 1989). The data being sought in this study is on the distant edges of current knowledge in that it covers the topics of urban sprawl, the compact city and the potential application of residential densification - on which there has been very little attention paid in developing countries generally, with coverage virtually non-existent in Nicaragua, in either in academia or in practice. Despite urban sprawl, the compact city and residential densification being very widely recognised as being important issues for future growth in the urban areas of economically developed countries, these topics are truly at the distant edges of current knowledge in the economically developing world, and could be perhaps be said to be ‘beyond the distant edges’ in Nicaragua.

According to Rowe and Wright (1999), the Delphi technique has four central features. These are: that the experts participating have anonymity; the Delphi technique is iterative in nature and has multiple stages of data collection, analysis and data refinement; there is feedback of the findings from one stage of enquiry into the next stage; and at each stage there is aggregation of the responses from each individual expert to form a group response (Rowe and Wright 1999 cited in Garrod and Fyall 2005).

The Delphi method involves an established procedure which is as follows. Individuals with experience of the appropriate field of study are selected – through a sampling procedure if necessary – and are asked to participate. The group of ‘experts’ that agree to take part then complete a series of two or more questionnaires individually. It should be noted that here the term questionnaire refers to a series of questions which are delivered to the research participants, though not necessarily requiring the participants to write down their answers. As used here, the term questionnaire can refer to a case whereby the participants deliver their answers verbally in an interview scenario. How structured the questionnaires are can vary from one study to another and they can be delivered by whatever means the researcher feels is appropriate, e.g. by email, letter or telephone, or in person in an interview like interaction. The first questionnaire is known as a ‘scoping questionnaire’ in which the experts are encouraged to establish the central points pertaining to the study which require attention. This is generally done within parameters for the study set by the person(s) responsible for coordinating the research. Generating a sense of the parameters could include setting an aim and objectives for the research and communicating them to the experts when they initially engage with the research. The results of the scoping questionnaire are then collated and used to create the second ‘convergence questionnaire’ which the participants receive together with details of their aggregate responses from the first stage questionnaire. In the convergence questionnaire the participants are required to make further judgements and give further data, taking into account the aggregate response from the first stage. The results from the second questionnaire can either be: used to create aggregate ‘judgement responses’ – which can be shown to each participant for final verification if required – and used as findings and applied to the situation being studied; or can be used to create a further ‘convergence’ questionnaire for further refinement and development of the findings (Frechtling, 1996) (Richey et al., 1985) (Garrod and Fyall, 2005) (Archer, 1976) (Smith, 1995).

3.11.1 The use of the Delphi technique in this study

In this study a two stage Delphi technique is used to conduct the data collection and guide data analysis - consisting of two Delphi questionnaires, the first a scoping questionnaire and the second a convergence questionnaire.

Both the first and the second Delphi questionnaires were completed in person with each participant in an interview like setting. This was done to achieve the best possible completion rate for the questionnaires, to help generate commitment to the study from participants and to gain the fullest and most detailed possible responses from participants.

Before the participants completed each questionnaire, they were sent a copy by email and then took part in a face to face meeting with the author to ensure they had received and read the copy and any other written information they had been provided with. The face to face meeting also gave the author the chance to answer any questions the participants had - taking care to avoid giving them any information that would alter their likely responses.

Before the participants completed the first questionnaire, in addition to a copy of the questionnaire, they also received a document which gave an introduction to the study, setting out its context and its aims and objectives and establishing its boundaries. All participants also received a document which described in images and in text some of the test sites which had been used to calculate housing densities in the first part of this study. The test sites described in the document covered the different housing types established in the first part of the study, whose densities differed from each other considerably. The document accompanied the first group of questions in the 1st Delphi questionnaire whose central aim was to explore the participants' knowledge of housing densities and particularly their ability to estimate the densities of given examples of housing. Before the second questionnaire, in addition to receiving a copy of the questionnaire, all participants also received details of their aggregate responses from the first questionnaire.

An advantage of the multi-stage nature of the Delphi technique and the fact that details of the participants' responses are fedback to the participants between stages is that there is repeated contact between the participants and the researcher which hopefully encourages in the participants a sense of commitment to the study and an interest in its outcomes. This can help attain a high retention rate of participants from one Delphi stage to another. It was hoped that participants would have developed enough interest in the study after the first questionnaire and feedback to strongly encourage them to complete the second part. It was also hoped that by providing feedback to participants after the first stage they would be encouraged to take part in the second stage.

This feedback strategy also helps to make the study as 'empowering' as possible for the participants, in terms of giving them knowledge and insight that they will find useful professionally. The strategy of multi-stage face to face Delphi research with interim feedback helps the researcher to engage and hopefully empower the participants in line with the Freirian ideas which will be mentioned later in this section of the thesis. In addition, the strategy helps give the participants the sense that they have a degree of control over determining the direction that the research took in the second stage. It was made clear to the participants that their responses in the first stage of data collection would help determine the direction of the second stage of data collection.

The first Delphi questionnaire had a number of objectives. First of all, it was designed to measure the participants' level of awareness of what housing density is, how it is measured and, as mentioned previously, approximately what levels of density different types of housing exhibit. Secondly, it aimed to gather their views on the current extent of urban sprawl in the case study cities, whether or not the current situation was good or bad and how appropriate they thought compact city thinking - including residential densification - was for informing future residential development in the case study cities. If a participant expressed that urban sprawl was occurring, that it was a problem and that compact city thinking/residential densification were appropriate responses then the participant would be asked to provide their thoughts on how residential densification might be achieved in the case study cities in practice. They would also be asked to identify and describe in detail the current barriers to residential densification in the case study cities.

In the first questionnaire, the questions were worded and assembled in such a way that it made it possible to determine fairly how aware participants were of what housing density is, how it is measured as well as determining how able the participants were to estimate the densities of different types of housing. As mentioned previously, this also made use of a separate document with descriptions of different density test sites from the first part of this study. The questions were also designed to allow participants to fully express their honest opinions about the extent to which urban sprawl was a problem or not in the case study cities, if it was how appropriate compact city thinking/residential densification were as responses and, if it were, what methods of residential densification could be used in the case study cities.

Scoping research at the beginning of this study had identified that large scale urban sprawl was occurring in the case study cities. In addition, the review of existing academic literature and internationally accessible material from practice that informed the first few chapters in this thesis had built up an international picture of how damaging urban sprawl can be and the opportunities for responding to this with more compact urban development, including through residential densification. The scoping research had also achieved a preliminary identification of some of the possible barriers to residential densification in the case study cities. This information from the scoping research and the analysis of academic literature and material from practice helped create the first questionnaire.

The second questionnaire was used to verify and extend the findings from the first questionnaire. Based on what had been gathered in the 1st questionnaire and where it was thought energy would best be focussed to gather further relevant high-quality data, it was decided that the focus of the 2nd questionnaire would be on offering the participants ample opportunity to refine their opinions on what the current barriers to residential densification in the case studies were. As was previously mentioned, the second questionnaire was provided with a document outlining the aggregate response of the respondents from the first questionnaire. This issuing of interim feedback is required by the Delphi technique and helped the research methodology applied during this study agree with the principles of Freirian research.

The Grounded Theory, elements of which have some influence on this study, advocates that data analysis should not be a distinct, isolated and final section of the research process but should be performed throughout the process. Grounded Theory dictates that data analysis should be used to influence the direction of research as it proceeds and to refine procedures for further data collection (Allan, 2003) (Punch 2005) (Gilbert 2001). The way in which this research methodology interprets the Delphi technique is in this sense quite close to Grounded Theory thinking. Based on this it was decided that the focus and structure of the results and discussion section of this thesis - this being the vehicle through which the meaning and significance of the data is explored - would be determined by the nature of the data to come out of the Delphi process. In fact, this meant that a major focus in the results and discussion section in this thesis was the participants' description of the barriers to residential densification in the case study cities.

3.11.2 Using a single Delphi group for all participants

The scoping research conducted before the Delphi part of the study allowed preliminary identification of the conditions regarding urban sprawl and the barriers to residential densification in each of the case study cities. The fact that there were so many similarities between the situation with sprawl and the barriers in each city was striking. It was also striking how few urban planning/housing professionals are employed in local government and in the C2C organisations in each of the case study cities, often to the extent that the 'urban planning policy department' in the municipal government of a case study city may consist only of a single individual. There are also very few Nicaraguan academics working in the fields of urban planning and/or housing and even less with experience of sprawl or the barriers to residential densification in secondary cities. As a result, it was decided to group all expert participants (professionals from local government in the different case study cities and Nicaraguan academics at national universities in Managua with experience of the case study cities) together in a single Delphi group. The fact that professionals from two different types of organisations (local government and national universities) will be taking part in the research and that the participants are from four case study cities – as well as Nicaraguan academia – means that it is possible to achieve some degree of triangulation through the data.

3.11.3 Using the Delphi technique to identify research problems and solutions

‘Test research’ that (Roth and Wood II, 1990) conducted in order to evaluate the Delphi technique provides a successful precedent for the use of Delphi to identify problems and solutions during the progression of a piece of research. The ‘test research’ of Roth and Wood II is akin to the way in which this study uses the scoping research and improvements made to method in the course of the Delphi process - from the 1st questionnaire to the 2nd - to be mindful of any helpful tweaks to process that can be made during the research. The ’test research’ of Roth and Wood II was successful in identifying improvements to research methodology which helped advancement their work.

3.11.4 Notable advantages of using the Delphi technique as described in academic literature

The British Council (Council, 2009) state that the Delphi technique is particularly suited to:

> *establish[ing] as objectively as possible a consensus on a complex problem, in circumstances where accurate information does not exist or is impossible to obtain economically*

The quotation above highlights that it is precisely in situations where accurate information does not already exist that the Delphi technique is particularly useful for piecing together a picture of what is known by experts and for reaching a consensus among the experts about the shape and details of that picture. By eliciting responses from a group of respondents, the Delphi technique allows researchers to dig below the surface of an issue which may seem difficult to research because of a lack of existing research and/or data and ‘tap into [the ‘hidden’] expertise and insight’ offered by the group (Garrod and Fyall, 2005).

There is no existing research or data about sprawl, compact city thinking, residential densification or barriers to residential densification in Nicaraguan secondary cities but scoping research as part of this study has demonstrated that local experts operating in the fields of urban planning and housing (local government employees) as well as Nicaraguan academics working in the same fields have knowledge on this area.

The Delphi technique also has the following advantages:

First of all, the Delphi technique provides a powerful resource for managing and amalgamating, in an organised way, the input of multiple respondents acting ‘as knowledge sources’ (Roth and Wood II, 1990).

Secondly, the Delphi technique is a very useful tool for producing findings by reaching consensus among groups of respondents. Roth and Wood II (1990), describe how the technique has been shown to be ‘successful in eliciting a large number of key concepts and factors’ from respondents and ‘developing some consensus among the participants on a core set of issues’ (p. 320). The iterative nature of the multi-stage process, whereby the results from stages are fedback to inform the later stages of enquiry, tends to encourage consensus building (Smith, 1995).

Thirdly, the Delphi technique is also known to be effective at allowing respondents to speak openly about the issues relating to the research study. As participants are anonymised and don’t meet together in focus groups the possibility of members of the Delphi group unduly influencing the input of other members is significantly reduced (British Council 2009) (Garrod and Fyall 2005).

In this respect, the Delphi methodology is perfectly suited to the environment of urban planning and housing debate in Nicaragua where it is often the case that younger and less experienced professionals are afraid to fully express their opinions in the presence of older and more experience professionals. Nicaraguan society is also very divided into political tribes which are very present and influential locally and in academia and there is great influence from local political and landowning ‘caudillos’ <chiefs or strongmen>.

Fourth, the iterative nature of the Delphi technique, refining the data through feedback of the results from one stage of data collection to inform the next stage is, according to (Ayton et al., 1999), more likely to improve the accuracy and validity of the data obtained after completion of the iterative process. Participants are given more time and opportunity to produce informed and reflective responses rather than the data they produce being the result of immediate and ill considered responses during a single ‘one chance only’ data collection session.

Finally, Roth and Wood II (1990) note that the Delphi technique is particularly useful in gathering data from groups of experts who are geographically dispersed from each other or where it is impossible or impractical to gather them together in a single place. The technique effectively brings the input of the parts together ‘virtually’ to create ‘a whole.’

In Nicaragua, the Delphi participants are geographically dispersed (based in secondary cities throughout the Pacific half of the country). Participants are likely to have restricted time to participate and the study has limited financial resources. It is therefore impractical to gather all participants together in a single place to take part in large face-to-face sessions.

3.11.5 Selecting Delphi participants

Participants taking part in Delphi data collection are often referred to to as ‘experts.’ Individuals who could offer expert insight into the realities of urban sprawl, the planning and development of housing and barriers to residential densification in the case study cities are very limited in numbers. Through the scoping research some of these individuals were identified. Snowballing was used to identify further people. It was decided that all those in the relevant professional areas with expert knowledge take part in the study and form a single Delphi group. All participants belonged to the following professional groups: professionals working in the field of urban planning and/or housing in the case study cities working in local government; or Nicaraguan academics working in the field of urban planning and/or housing. The single Delphi group numbered 17 people.

As it was intended that all those with expert knowledge within these professional groups be included in the data collection, further sampling of participants was not required. The study simply involves all members of the small group of people who are qualified to take part.

Garrod and Fyall (2005) note that in the research situations where the Delphi technique is particularly appropriate – where accurate information does not already exist – the numbers of experts are very often small meaning that developing a sampling frame is often impossible.

3.11.6 Arranging initial meetings during the 1st data collection trip with potential Delphi participants who work as local/municipal government employees in the case study cities

During the scoping research conducted early on during the 1st data collection trip to Nicaragua the author visited the following departments of municipal government wherever they were present in each of the 4 case study cities: urban planning (planning policy), development management/control, housing, land/property valuation for tax purposes, urban development project planning, environmental control, international cooperation. This set of departments constitutes the entirety of what the author considered relevant to the area of research being pursued.

Later on during the 1st data collection trip, in each city all relevant local government departments were visited and potential Delphi participants were identified.

Where a department was present in the municipal government of a case study city, an appointment was sought with the director of the Department to discuss the research (in many cases the director was in fact the only municipal government employee working in the Department). Fortunately, the author was successful in arranging an appointment with all of the people with whom one was sought. Snowballing was also used, i.e. other professionals from the local governments who may have been appropriate to arrange appointments with were identified when talking to the directors.

3.11.7 Arranging initial meetings during the 1st data collection trip with potential Delphi participants who work in Nicaraguan academia

During the later part of the 1st data collection trip to Nicaragua, the author made visits to all higher education institutions in the country which teach architecture. These institutions were: Universidad Nacional de Ingenieria (UNI), Universidad Centroamericana (UCA) and Universidad Nacional Autonoma de Nicaragua (UNAN).

It is important to highlight that urban planning and housing are not considered as professions in their own right in Nicaragua and as such undergraduate degree courses in these subjects are not available. In the case study cities all of those employed as directors in relevant departments of municipal government with sufficient knowledge to take part in the Delphi process were Nicaraguan architecture graduates. Incidentally, this was also the case for those identified as potential participants from the higher education sector.

During the visits to the universities teaching architecture, appointments were arranged to meet the directors of the architecture programmes in each of the universities. In each case these meetings successfully took place and the author made a proposal to give a presentation to members of staff in the Department about the research. In each case this proposal was enthusiastically accepted. The presentations were given approximately 2 weeks later in each of the universities and at the end the author made an invitation to meet individually with anybody interested in the research. Response was good and these meetings were held in each case a few days after being arranged.

3.11.8 Selecting those with enough knowledge and experience to participate in the Delphi process and proposing participation

Despite some of the appointments being delayed or having to be rescheduled, the author was able to discuss the research at some length with all of those with whom an appointment had been set up. This was all of those from local government and academia with whom an appointment was sought. These initial meetings were not recorded on a dictaphone in order to allow the participants to be more open in discussing the issues. All of the participants agreed for the author to take notes with a pen and paper. These meetings were essentially to get to know the people a little better, to determine whether they were equipped in terms of knowledge to take part in the Delphi part of the research and to see if they would be prepared to take part and commit to participating in all of the Delphi stages.

A short time after each meeting, while the author was still able to clearly recall what was discussed, more detailed notes were written about the contents of the meeting. In addition, based on the depth of knowledge and experience that each participant had expressed, and where the participants had said they wanted to take part in the Delphi process, a judgement was made about whether they would be suitable as a Delphi participant. Very close to the end of the 1st data collection trip small ‘thank you’ gifts were taken to all those with whom the author had meetings and those considered suitable Delphi participants were asked if they wanted to take part. Effectively this meant that all those in the municipal governments of the 4 case study cities who knew a sufficient amount about the topics in question were asked to take part in the Delphi process. Response was good and all of those asked to participate in the Delphi process agreed to do so. It was in late May 2009 that the participants were asked to take part in the Delphi process and they were made aware that if they agreed to participate in the research they would be asked to complete 2 questionnaires - 1 during the 2nd data collection trip in an interview like session and another during the 3rd data collection trip also in an interview like session. Those asked to participate were also made aware of when the data collection trips would take place, e.g. the 1st Delphi data collection round would take place in January 2010.

Contact between the author and each of the participants was maintained by using e-mail and Skype internet telephony after the 1st data collection trip to Nicaragua.

The participants were also made aware that the author would have a brief review meeting with each of them individually in early January 2010 at the start of the 2nd data collection trip to Nicaragua. The purpose of the review meetings was to give each of them in person a copy of the 1st Delphi round questionnaire with supporting documents. At the review meetings an appointment was scheduled with each of the participants for another time in January or February 2010 at least 2 weeks after the review meeting. At these appointments the 1st Delphi questionnaire would be completed in an interview like scenario with each of the participants individually. It was important to have at least 2 weeks between the review meeting and the appointment for completing the questionnaire in order to give each participant is ample time to read all documents, understand what they were being asked to do and consider their responses. Any additional time available to the author during the 2nd data collection trip was occupied with conducting further density calculations in the 4 case study cities.

The total number of Delphi participants consulted for this study (17) represents the total number of people found in local government in the case study cities and in Nicaraguan academia who were qualified to talk in depth about the topic of the study. As has been mentioned, snowballing was used to optimise the number of interview participants. The fact that only 17 people were qualified to talk in depth on the subject illustrates how small the number of people working professionally in this field is. In fact, the housing and urban planning sector in Nicaragua, particularly at the level of local government, is very seriously under-resourced.

3.11.9 Informing potential Delphi participants about the research and encouraging them to take part

During the 1st data collection trip to Nicaragua, when participants were being recruited, each person asked to take part was given a document which outlined the scope of the research, explained the themes behind it, explored why it was important for Nicaragua and outlined its academic value and the benefits that the research could offer the participants as urban planning/housing professionals. At that stage, the scoping research had only just been conducted and the scope of research had not been fully defined. The document that the participants were given highlighted that the research was useful because very little academic literature existed about urban planning/housing in the country, and particularly in secondary cities. Large dynamic population growth in the 4 case study cities combined with great housing demand in those cities, particularly in low income sectors, meant that data and academic discussion to better illuminate these phenomena was required. The relatively poor state of current housing provision, again particularly in low income communities, in the 4 case study cities also meant that any data or literature which could better direct future housing interventions would be of great benefit. Both of these last two points were also communicated in the document given to the participants.

In addition, participants realised the potential of the research to offer them an opportunity to satisfy professional curiosity and provide a form of professional development. During the scoping research, the author also became aware of the extent to which in Nicaragua, with resources lacking in local government and higher education, a Ph.D. student with a number of years available to devote to researching a novel area is a valuable resource, particularly when the scope of the research is very ‘applied’ as opposed to being of entirely theoretical academic interest. The ‘applied’ nature of the research was also highlighted to potential participants and it became apparent this aspect of the research was attractive to many practitioners.

During the review meetings in the 2nd data collection trip to Nicaragua, a further document was given to participants which outlined in greater detail and specificity the scope of the research and the benefits of taking part in the research. By this time, the scoping research had been fully analysed and it was possible to make the specific aims and objectives clear. At this stage, the 1st Delphi questionnaire had also been completely written. The document given to participants identified and described the phenomenon of urban sprawl as well as the ideas of the compact city and residential densification. All of these elements were described in a general sense so that the participants were free to express their own opinions about whether or not they applied to the situation in the case study cities. Furthermore, the document framed these elements in the important international context of urban population growth and increasing urban housing demand. Finally, the document also described how the research adopted 'Frerian thinking' which promotes academic research as an opportunity to empower research participants and which suggests that research should be designed so as to allow them some control over the direction the research takes. 'Frerian thinking' also promotes the importance of providing participants with feedback on findings which can be of benefit to them in a professional sense, i.e. promoting their own continued professional development.

3.11.10 Designing and conducting the Delphi questionnaires

As explained earlier, this research uses a case study approach and a mixed methods research method. As a component of this, the Delphi process mainly consists of qualitative data collection and analysis. Both of the Delphi questionnaires had a semi-structured design and were completed with the researcher and participant face-to-face. Again, for both questionnaires the questions in the questionnaire were read aloud by the researcher (though the participants had seen the questionnaire and accompanying documents in writing in advance and could refer to the written documents whenever they wanted to) and the participants giving their answers. This effectively took the form of an interview like scenario with sessions consisting of the author working in private with only one participant at a time.

The questionnaires were semi-structured so as to give sufficient flexibility for the participants to express, and have recorded, their thoughts without being limited by the questions being very tightly structured, ordered or narrow in scope. Obviously, the questionnaires were written and presented in writing to the participants in a set order but, for example, if during the course of answering one question the participant gave information that related to another question the researcher did not stop the participant and allowed them to continue. This meant that when working with the participants the researcher had to remain mindful of the questions that had been covered and those which hadn't, so they would be brought up later. Very little written information exists about sprawl, the idea of the compact city, housing densities or residential densification in Nicaragua and the Delphi technique was used in response to this in order to explore the information that does exist 'within the heads' of the participants. In order to be sure that critical points related to the target topics in the case study cities were detected it was critical that the author should not try to 'second-guess' the participants' responses by too closely defining the exact order of the questions or the boundaries of each question before completing the questionnaire with the participants.

It is important to emphasise that the questionnaires were semi-structured as opposed to unstructured. Although the author was very aware of the need to avoid constraining the participants' responses, completely unstructured input from the participants would have made it virtually impossible to identify common themes and patterns as findings by comparing the output of different participants. If the approach had been completely unstructured each individual participant would have likely discussed a completely different set of topics very broadly related to the target topics - or maybe not related at all.

3.11.11 Completing the 1st and 2nd Delphi questionnaires as pilots with the first 2 participants

Both questionnaires were conducted as pilots the first two times they were completed with participants. The same 2 participants were used to conduct the pilots for both questionnaires. The aim of piloting the questionnaires was to identify any ways in which the structure and presentation of the questions could be improved. The aim was not to adapt the topics the questionnaires covered or the order of the questions as the questionnaires were semi-structured and the order of questions was flexible to allow each participant to address the different questions in the best way for them and in the way that emerged during the session.

Data from the pilot questionnaires was used during data analysis in exactly the same way as data from all the other questionnaires. The questionnaires were semi-structured and it was not necessary to directly compare the responses of different participants to identical questions in an identical order, but rather to compare the points, opinions and details which each participant gave during the course of each questionnaire. This meant that the pilot questionnaire completions had an equal status to all other questionnaire completions for the purposes of data analysis.

3.12. Issues of ethics and risk

3.12.1 The relationship between the researcher and others during the research

Prosser and Schwartz (Prosser and Schwartz, 1998) discuss the importance of the researcher recognising the position they occupy in relation to the ‘subjects’ (Prosser and Schwartz, 1998) of the research, the ‘community of practice’ (Wenger and Snyder, 2000) and even the society in which they are operating. Prosser and Schwartz refer to the benefits of the researcher as an ‘outsider[s]’ operating at a ‘critical distance’ (Prosser and Schwartz, 1998) from the ‘world’ occupied by the subjects but they also acknowledge the contrasting benefits found when the researcher operates as someone with a useful closeness to the subjects and their world. They also consider how ‘outsider’ researchers can ‘build a bridge’ between them and ‘their subjects’ (Prosser and Schwartz, 1998).

In the terms described above, the author/researcher, as a British national working in Nicaragua has the benefits of operating at something of a distance from Nicaraguan society. However, it is also hoped that a useful closeness to the subjects and ‘their world’ can also be created. The author lived and worked in Nicaragua for 3 years and has a great deal of tacit knowledge about the geography, society and culture of the country. The author is also fluent in Nicaraguan Spanish and works in the country without the need for a translator or interpreter which if used are effectively barriers in themselves. In addition, the design of this study means that subjects are in fact active participants who are empowered with the ability to determine the direction of the research.

For example, the researcher's choice of photographs to illustrate different types of housing found in the case study cities, which are used during completion of the 1st questionnaire, will reflect his position with respect to the subjects and the community of practice or society they inhabit. Photographs which the researcher claims are representative of housing in the case study cities and a certain type of housing will reveal to what extent the researcher understands Nicaraguan society and the themes of planning and housing in the case country. Indeed, photographs are fascinating windows of comparison 'within the sociological research process' (Prosser and Schwartz, 1998), juxtaposing one person's experience and view of the world with that of another. It is hoped that the photographs used to represent housing in the case study cities project an experience and a view of the world that the participants recognise.

3.12.3 Making the participants aware in advance of what to expect from the questionnaires

As was previously mentioned, at the review meeting conducted with each participant at the beginning of the 2nd data collection trip to Nicaragua the participants were given a copy of the 1st Delphi questionnaire together with details of the case study housing types identified by the author illustrated with photographs of sites representative of each housing type taken by the author. This meeting was organised ahead of the time when they would complete the 1st questionnaire with the author. At the review meeting, the participants were also given a document which discussed the justification for the research as well as its aims and objectives and the benefits to them of their involvement. A document was also provided at the review meeting describing in a general and objective sense the phenomenon of urban sprawl and the ideas of the compact city and residential densification. In the review meeting, the participants were advised to read these documents ahead of the appointment at which the questionnaire would be completed and to consider their responses to the questionnaire questions which they would be asked next time they saw the researcher. It was made clear that the questionnaire would be conducted, effectively, as a semi-structured interview with the researcher. It was also made clear that their consent was sought to record the interview with a dictaphone. They were also asked if they would be able to complete and sign a research participation consent form which would give the author their consent to use their responses anonymously in the research. Assurances were made about confidentiality and anonymity which are detailed in the section below:

3.12.4 Assurances made to participants concerning confidentiality and anonymity

The number of urban planning/housing professionals in Nicaragua is relatively small and professionals are often familiar with other professionals working in different institutions. This includes familiarity between people working in different local governments and between local government and higher education. In fact, a number of professionals have worked in more than one of the institutions from which participants were drawn in this study and it is reasonably common for higher education professionals to do consultancy work with local government. The greatest familiarity between urban planning/housing professionals in different institutions seemed to be between the higher education institutions based in Managua and local government in Granada and Masaya, and also between the two local governments of Granada and Masaya themselves. There is more distance, both physically and in terms of levels of familiarity, between the higher education institutions and local government in Granada and Masaya and local government in León and Matagalpa. There was also relatively little familiarity between the local government in León and that of Matagalpa. Where there were higher levels of familiarity between institutions it was fairly likely that participants in this study working in those institutions would be acquainted with professionals in the other institution(s).

Across Nicaragua, as is commonplace in many developing countries with poorly developed public institutions, nepotism has a great deal of influence on who gets what jobs within publicly funded institutions (including in local government and the higher education institutions from which participants in this study were drawn). Recruitment to posts continues to be largely facilitated through personal and political contacts and the public at large is never even really made aware of what posts are available. Nepotism is also significantly at work when it comes to promotions within publicly funded institutions. As a consequence, 'currying favour' and cultivating personal and professional contacts is extremely important for determining the success of an individual's career trajectory and ultimately their opportunities for securing financial wellbeing and security.

It is not difficult to imagine how the likelihood that participants in the study would be familiar with each other, the fact that nepotism is widely active in institutions from which participants were drawn, combined with the system of giving interim feedback on findings to participants that is part of the Delphi meant that participants would likely value assurances on confidentiality and anonymity. The widespread nepotism in how recruitment and promotions are handled in publicly funded institutions made the risks greater for participants if they involved themselves in the research openly and honestly without measures in place to secure a degree of confidentiality and anonymity.

A statement of confidentiality and anonymity in the research (which detailed the measures which would be put in place to achieve this) was presented to the participants in the review meeting at the start of the 2nd data collection trip to Nicaragua. Each participant agreed with what this statement said and signed it. The statement was also shown to participants before each of the Delphi questionnaires were conducted. As was the case with both of the questionnaires and all of the other material given to participants, the agreement was written entirely in Nicaraguan Spanish. It stated that confidentiality was to be assured by the secure storage of audio recordings and any written material made which referred to the participants or their responses. This included all notes made by the author and all transcriptions from the recordings of the questionnaire sessions. Any additional notes made during data analysis was also stored securely. All written material made visible to people other than the author was anonymised to protect the identity of the participants. This included material prepared for supervision meetings, PhD progression reviews, verbal presentations or academic papers. Anonymity also clearly extended to the PhD thesis itself.

Participants' anonymity has been guaranteed, as generally participants have not been referred to in writing as individuals. Rather, it has been the aggregate response of all participants which has been important, in line with the principles of the Delphi technique. If participants have to be referred to as individuals, for example, to attribute a direct quotation to one of the participants their names are not given and they are only described in such a way that it would not be possible for the reader to identify them.

3.12.5 'Empowering' research methodology

A key objective of this research is to involve participants in a way that empowers them and helps them build their professional capacity. This could be considered as 'giving them something back' for participating in the research. This is in line with the Freirian idea of 'empowering research' (Lather, 1986). The Delphi technique can be particularly effective at achieving this because of the iterative involvement of the participants in the research - including to determine the focus of the 2nd questionnaire - and because participants have their aggregate responses, and the findings and benefits of the research fed back to them.

3.12.6 Ethical considerations

All research activity conducted as part of this study conforms to the research ethics policies of Northumbria University, the Faculty of Engineering and Environment and the Built and Natural Environment group. The author understands that correctly observing these policies is critical for protecting both the researcher and the research participants and is essential for obtaining valid data.

A critical requirement of these policies is the need for everyone participating in research to be fully informed of how the information they provide will be used and who it will be available to. Research participants must agree to this and provide their written consent. Participants must also be fully aware of the nature of the research that they are contributing. In addition, if anonymity is to be provided participants must be made aware of the strategy for guaranteeing anonymity. This will be achieved by ensuring that in all written material which is accessible to people other than the author individual participants will only be referred to in ways in which their identity cannot be established by those reading the material. Furthermore, all audio and written data collected from respondents and any written notes in which respondents are identified individually is kept in a locked cupboard. Written statements detailing how data will be used and how anonymity will be guaranteed in this research were provided to the participants at the beginning of their involvement. Any questions that the participants had were answered clearly and honestly. All statements and the consent form was provided written in Nicaraguan Spanish.

Nobody aged less than eighteen and nobody considered vulnerable took part in this research and so issues concerning the protection of minors or vulnerable people are were foreseen or were encountered.

Photographs were taken as part of the research (for characterising the housing types in the case study cities and for making records of housing density test sites). Consent was always sought if images were focussed on individual people or their property or included minors.

All of the ethical considerations mentioned in this section are true for the scoping research, the process of identifying housing types and measuring the housing densities of density test sites and for the Delphi process.

This research was subject to a standard Northumbria University research ethics audit which employed the Research Governance Audit Tool for Research Projects. The research was approved and no points of concern were raised.

3.13 Western researchers and pressure groups in developing countries

As Leininger (1995) makes clear (Papadopoulos and Lees, 2002):

> *without cultural awareness researchers tend to impose their beliefs, values and patterns of behaviour upon cultures other than their own ... [and] it could be argued that this perspective leads to invalid research data.*

Papadopoulos and Lees (Papadopoulos and Lees, 2002) go onto to stress the importance of ‘culturally competent research’ which seeks to mitigate these dangers. The terms ‘culturally sensitive research’ (Tillman, 2002) and ‘culturally relevant research’ are also used.

Cultural differences can be particularly great between developed and developing countries. The vastly different economic realities and the very different views regarding the appropriate role of traditional beliefs, customs and practices in society can be particularly instrumental in creating these differences (Gamman, 1994). Smith (Smith, 2005a) describes how these differences, and the processes of political history which have influenced the formation of these differences, can work to limit the empathy that western researchers are capable of when they encounter ‘very different ways of doing things’ in developing countries. It can be difficult to fully appreciate the merits of alternative paradigms for development for anyone encountering them in social and cultural conditions which are extremely different from ones they are more accustomed to.

A rather ‘leftfield' source regarding these issues, but one which is thought-provoking in its interpretation is provided by Evelyn Waugh’s novel ‘Black Mischief’ published in 1932 (Waugh, 1932). It presents an extremely satirical examination of the post-conflict development of a fictional East African island nation Azania. Although, many modern literature critics have debated the extent to which the book demonstrates a clichéd, imperialistic and even racist standpoint, the novel takes an equally critical view of western interests in the country including development missions and pressure groups, modernist ‘New Age’ African political leaders, European diplomatic missions and corrupt African political elites.

Waugh ridicules the over zealous work of Dame Mildred Porch and Miss Sarah Tin, two British representatives of the ‘Dumb Chums Club’ an animal rights organisation visiting Azania. Their all consuming concern for the welfare of dogs and goats is comically misplaced in a country where a civil war has just finished and where another one is about to start, and their majority of whose human populace are extremely poor.

In the book, Dame Midred Porch’s diary provides an insight into her Azanian crusade. She writes of her first day in the capital city, ‘fed doggies in market-place. Children tried to take food from doggies. Greedy little wretches’ (Waugh 1932). It is clear her that her ‘beliefs, values and patterns of behaviour’ as Leininger (1995) (Papadopoulos and Lees, 2002) puts it are so entrenched as to make it impossible for her to see the ‘bigger picture’ in a country wracked by human conflict and suffering. Dame Mildred comments on one journey with the following: ‘road to station blocked [by] brown motor lorry. Natives living in it. Also two goats. Seemed well but cannot be healthy for them so near natives.’

The strength of Dame Mildred Porch's opinions regarding animal wellbeing which she tries to impose on a country which clearly has other priorities is accompanied in the book by the Emperor Seth's unswerving and all consuming commitment to promoting birth control and 'sterility' in his country above all else. He is determined to promote many of the 'current European fashions' that he reads about in newspapers and magazines in Azania but fails to do any analysis of local public or political opinion on any of them. Regrading birth control, he eventually goes so far as to hold a 'Birth Control Gala' at which he is deposed as leader in a coup d'état and he renames the site of the Anglican Cathedral - which he had demolished to make way for his groundbreaking city plans - as 'Place Marie Stopes' (Greenberg, 2006).

Although this commentary on Waugh's 'Black Mischief' provides something of a comic interlude in this study, it raises the prospect - although admittedly through some rather extreme examples - of what can happen to well meaning ideas formed in the societies of developed countries when attempts are made to study or introduce them in developing countries without due consideration of their appropriateness. Consequently, it is extremely important that research in developing countries is 'culturally competent/sensitive/relevant' to the context and realities of those countries.

Part 2: Findings 1, Current Context and Housing Typology

Chapter 4. The Nicaraguan context and the case study cities

4.1 Introduction

This chapter has two main aims. First, given the lack of academic literature on Nicaragua specifically, it seeks to discuss the country generally in relation to the major findings from the literature review. Second, it presents the current context of the 4 case study cities, so that the reader may be more familiar with the topographical, historical, political and socio-economic situation.

4.2. Nicaragua in relation to the key findings from the literature

Nicaragua is a country where low urban housing densities predominate, both in terms of historic and modern housing and across income sectors. Nicaragua is within a collection of countries, Central America, where low urban housing densities predominate and is also part of a wider region, Latin America, where this is often also the case.

As noted in chapter 2, there is a complete lack of academic literature on the subject of urban dispersal strategy in a Nicaraguan context. Nevertheless, Nicaragua's national government has adopted urban dispersal as an explicit policy goal and a review of Nicaraguan government policy documents in this area, at a national and local level, identified the National Population Policy as the principal policy vehicle promoting the strategy (Gobierno de Nicaragua 2006).

Effective direction in the areas of urban planning and housing is obviously critical to enable government to realise any plans it has to drive demographic change in the country in which it governs. One of the findings from the scoping research conducted as part of this study is that in Nicaragua direction from central government is effectively non-existent in the area of urban planning and housing. In the light of this, it is unlikely that the central government policies which propose adoption of urban dispersal as a strategy can ever be effectively realised. Urban dispersal is happening in Nicaragua but it may be due to a host of varied economic, social and demographic phenomena rather than the strategic direction of central government.

Rates of annual population growth for the four secondary cities used as case studies in this study are given below in the table in fig.4.1 below and their locations are indicated on the map in fig.4.2.

City	**Rates of annual population growth**
Granada	4.37%
León	2.98%
Masaya	4.83%
Matagalpa	3.41%

Fig.4.1. Table giving rates of annual population growth for the 4 case study cities.

Fig.4.2. Map of Nicaragua, including the locations of the 4 case study cities (Lonely Planet, 2008).

The figures in the table in fig.4.1 were calculated by the author using data from the 2005 Nicaraguan national census and the 2008 Nicaraguan national statistical yearbook with updated population figures for 2009 (INIDE, 1995) (*INIDE*, 2005 a) (INIDE, 2008). These are the most up-to-date figures currently available. INIDE is the Nicaraguan national institute responsible for conducting population censuses in the country. These figures show that the four case study cities have high urban population growth rates. Material from practice in the areas of planning, housing and demographics etc and academic literature discussing population trends in the four cities for the period from the early 1990s until the present day also evidence the general trend of high rates of population growth in the four case study cities (Desarrollo, 2003) (Stein, 2001) (León, 1998) (Alcaldía Municipal de Masaya, 2005).

As discussed earlier, although these figures for the four case study cities show growth patterns that are in line with what would be hoped for under nationally adopted strategies of urban dispersal it is not at all certain that it is urban dispersal strategy or any type of government intervention which has given rise to them. In fact, in light of what has been said about the lack of effective direction from central government in the areas of planning and housing that cities in Nicaragua experience it is more likely that the patterns are driven by economic, social and demographic phenomena which are independent of the fairly ineffectual overtures of Nicaraguan central government.

Nicaraguan secondary cities are experiencing high need for housing and services. Urban population growth rates are high, including for the four secondary cities featured in this study and the four cities are very small in size when compared to Managua. A review of material from practice from Nicaragua, including particularly policy documents and plans formed by local government together with data from the scoping research conducted as part of this study have confirmed that population growth rates and housing need in all four of the case study cities is acute. In addition, a copy of a presentation obtained from the Alcaldia Municipal de León which formed part of the UN-HABITAT Best Practices and Local Leadership Program (Lopez, 2006) and a further document from León’s municipal government (Alcaldia Municipal de León 1998) describe the critical need for new housing in León to meet the needs of the city’s growing population. Rather bizarrely, one of the press sources to provide the greatest accuracy in housing shortages in the case study cities is an article from a Panamanian national newspaper and describes very high housing need in León (La Prensa, 2007). Lopez (Lopez, 2006) estimates that 1,400 new dwellings are required in the city of León per year. Local planning policy documents for the other case study cities also describe acute housing need (Alcaldia Municipal de Masaya 2005) (Alcaldía Municipal de Matagalpa, 2004).

Housing need in the case study cities is particularly great in terms of provision of affordable accommodation for low-income groups. For the urban poor in the case study cities, overcrowding in existing accommodation is common as extended families with many members often occupy small and insanitary conditions (Alcaldía de Masaya 2005) (Alcaldía Municipal de Matagalpa 2005) (Granada, 2004) (Angel, 2000).

Effective urban planning as well as housing management and development is critically required in all four case study cities. In Nicaragua and in other countries that are subject to very high need for housing and services, compact city approaches and residential densification can potentially provide cities with an option for driving urban development in a way that can help meet such dramatic housing demand.

4.3 Housing density and housing types in Nicaraguan cities

In order for incipient research to begin to evaluate the suitability of the Compact City concept for Nicaraguan cities (including the principle of raising housing densities), a methodology for measuring housing densities is required, tailored to the conditions found in these cities and compatible with the types of housing found there. There is no academic literature or material available from practice which is internationally accessible which describes practical methodology for making housing density measurements which is tailored specifically to Nicaragua or to any Latin American country. Literature from the global north and from outside Latin

America describing practical methodology for measuring housing density is readily available but must be adapted for use in Nicaragua or other countries in Latin America (or others in the Global South as was previously mentioned) to account for the unique set of housing realities found there.

In Nicaragua, despite a thorough search, the author has been unable to locate - or find anyone who knows of the presence of any significant record of existing housing densities in the country. In a very small number of plans or policy documents produced by different local urban governments from around the country fleeting reference is made to density figures, e.g. an intended average density is given for a housing development in the city of Granada (planned and still not built years after its projected end date). In these couple of instances, the very small number of figures provided are only ever mentioned in a fairly haphazard way, isolated and unaccompanied by any other figures for density or discussion of density. Also, in the author's experience of where such figures are mentioned in Nicaraguan documents there appear to be no standard units used for density, i.e. some are given in people per manzana and others in dwellings per sq kilometre. Furthermore, the units used are never those most widely accepted for use internationally.

In addition, crucially, there is also currently no academic literature covering Nicaragua, or any material from practice that the author has been able to obtain, which identifies the different types of housing that are found in Nicaraguan urban areas. Establishing this sort of typology is critical for building up a full and organised picture of urban densities in Nicaragua. Such a typology will be created as part of this study.

4.4. The case study cities

In this section of the study the four case study cities selected will be described. The section draws on a combination of literature and the author's initial scoping study and subsequent fieldwork. For each city, the description consists of the following: a short introduction to the city's historical development and its geographical location, a profile of the topographical characteristics of the land it occupies with an indication of any significant geographic barriers to spatial growth and a review of the existing data available describing the demographic and housing trends experienced by the city.

4.4.1 Granada

Granada is the oldest continuously inhabited city in Nicaragua. It was established in 1524 by the Spanish conquistador Hernandez de Cordoba and occupies a strategic position on the north western side of Nicaragua's largest lake, Lake Cocibolca. The lake enjoys access for ships to the Atlantic Ocean via the River San Juan. This accessibility allowed Granada to play a role as a centre for communications and for the passage of goods, including gold and silver, between Nicaragua and Spain. The city is located approximately 45 km south-east of Nicaragua's capital city Managua.

The current layout of the city's central area owes much to the original colonial masterplan created by mandate from the King of Spain in the 16th century. However, this contemporary layout is a less faithful preservation of the original colonial form than that found in the other case study city of León due in no small part to the burning of much of the city of Granada in 1856 by the US filibuster William Walker.

Despite the fact that central Granada operates on a street layout that is to a large extent colonial, many of central Granada's buildings, including residential buildings, were constructed after Nicaragua's independence from Spain in 1821, with many built after the fire of 1856. However, the majority of these buildings present, what the author has decided to term, an 'historic colonial style,' replete with courtyards - onto which windows and doors open - and pitched roofs. In addition, large areas of contemporary Granada are made up of housing in outlying peripheral locations, and a very large proportion of this housing was built in the 1980s and 90s.

The centre of the city of Granada occupies flat ground close to the lake shore, which is criss-crossed by small rivers flowing from nearby upland areas into the lake. The southern suburbs of the city rise in height as they get closer to the Mombacho volcano located due south of the city centre. Growth of the city is constrained in this direction, as it also is to the west of the city centre where the land rises sharply towards the Apoyo lagoon - a volcanic lagoon in the crater of an extinct volcano. In Nicaragua generally, land that is significantly inclined - and which has often been deforested as so much of Nicaragua's Pacific west has been - can be very vulnerable to landslides during Nicaragua's six month rainy season. Urban growth in Granada is also constrained to the east because the city already extends until the coast of the lake. In fact, the only directions in which further significant urban development is feasible is to the north where flat land extends along the shores of the lake and to the North West along the route of the highway to Masaya and Managua.

Granada is the site of some of the most extensive recently established informal settlements in Nicaragua outside Managua. In addition, the city has not had as much recent housebuilding aided by international cooperation as the other three case study cities.

4.4.2 León

In 2005, the 10-yearly national Nicaraguan census recorded the urban population of the municipality of León as 139 433 (*INIDE*, 2005 a), compared to a population of 937 489 for the municipality of Managua (*INIDE*, 2005 a). It should be noted that the entire urban area of the city of León is located within the boundaries of the municipality of León whereas this is not the case for Managua. Some parts of Managua's urban area lie within the boundaries of municipalities which neighbour the municipality of Managua.

Of the four case study cities, León is the city on which, until now, demographic information has been most available. Much of this information has come from a single particularly strong partnership organisation in the city which has taken an interest in demographics, housing and urban planning. This is the international cooperation partnership between León and the city of Utrecht in the Netherlands which is an example of a city to city (C2C) cooperation relationship. It is the most developed C2C relationship in Nicaragua and is one which has, for a number of years, been focussed on urban planning and housing in policy and practice. In comparison with other C2C arrangements in Nicaragua, the partnership has been particularly active in conducting research and producing research and policy documents as well as urban plans about León.

As was previously mentioned, León is the biggest city in Nicaragua outside Managua and is the location for the oldest and best respected university in the country, attracting students from all over the country. However, it has so far not been possible to locate anybody within the university working on population and migration in León.

A number of local documentary sources describe how the city of León is experiencing very high population growth, particularly among lower income groups, and that a large proportion of this is due to migration from rural areas inside and outside the department of León into the city. The sources also identify the challenges the city faces in providing infrastructure, housing, services and employment for its growing population.

León's local municipal government has conducted a rural socio-economic study (León, 2009) which concluded that rural households in the department of León are becoming unoccupied at a rate of 15% per year. Although no work was done as part of the study to determine the exact migration destinations of the people making up these households, the recently elected current mayor of the city of León has revealed that in his experience migration to the city of León makes up a large proportion of these movements.

The document León Master Plan: South East León Urban Expansion Project (León, 1998) describes the annual rate of population growth in the city as being 'very high (4.3%),' and states that a major cause of this is 'migration of the rural population to the city.' The master plan also states that the effects of the city's growing population include 'a lack of physical space [in the city]' and extreme pressure on the 'physical and environmental infrastructure' of the city and its surrounding areas. It is also stated that the city can only offer its residents limited job opportunities and municipal services.

León's Departmental Strategic Development Plan (León, 2005) reports on the presence of 'strong migration' (p. 19) tendencies in the department of León due to high incidences of unemployment. The document does not specify to what extent this tendency for migration results in people leaving the department as opposed to moving within the department. However, it does give values for development indices associated with the different municipalities in the department - the higher the values are the more economic developed the municipality is. While the values are described as 'high medium' (p. 20) for the municipality containing the city of León and the municipalities containing the department's two other principal urban areas, Nagarote and La Paz Centro - with urban populations of 19,381 and 20,390 respectively - the values are described as 'low medium' for all other municipalities – none of which contain any of the municipality's primary urban areas. The large differences between the values of the development indices for municipalities that contain principal urban areas and those municipalities that do not suggest at least the presence of strong push and pull factors for migration from rural to urban areas within the department of León.

At this stage it is useful to highlight that Nicaragua is separated into 15 departments and 2 autonomous regions and departments are themselves sub-divided into municipalities. In the department of León there are 10 municipalities and it is the municipality of León which has overwhelmingly the largest urban population (142,268) of all the municipalities.

Of the case study cities, León has seen the most low/middle income housebuilding in recent times. León's local government also has the most productive track record of the 4 case study cities of working with international cooperation organisations over the last 15 years, and a number of areas of formally developed housing plots or complete housing structures have resulted from such cooperation. These developments are occupied by low and middle income families.

The recordings of a presentation as part of the UN-HABITAT Best Practices and Local Leadership Program (Lopez, 2006) described the project undertaken by the Utrecht-León cooperation organisation to plan and implement an urban expansion area for León located on the south east periphery of the city. It is currently in the final stages of completion and the process of planning and implementation began in 1999. According to the presentation, the city's population in 1996 was 160,000 (an approximate figure) and the projected figure for 2008, including the completed urban expansion was expected to be approximately 215,000. Within the presentation it is also stated that there is a requirement in the city for 14,000 new houses over 10 years at an approximate rate of 1,400 per year. The stated objective of the urban expansion is 'a city with less problems and without slums (Lopez 2006, slide 10).

In a document entitled 'Utrecht International' written by the City of Utrecht Government to publicise its efforts in the field of international development, it is stated that 'the housing shortage in León is acute' (Government, 2007)

Managua provides an example of the result of large scale migration from rural to urban areas, added to natural growth of the existing urban population, without appropriate levels of house building for the income sectors which require housing.

This situation has been particularly serious in Managua since the 1980s and has resulted in the formation of large areas of slums, made up of informal housing, both within more established areas of the city and on its periphery. Dennis Rodgers and José Luis Rocha (Rocha and Rodgers, 2008a) (Rocha and Rodgers, 2008b) have written about how migration to Managua has caused slums to develop in the city and about the growth of gangs and the lack of security in many of these slum areas.

4.4.3. Masaya

Masaya is situated approximately 30 km south-east of Managua on the highway between Managua and Granada. The city is among the second wave of settlements established by the Spanish colonial authorities in Nicaragua after the cities of Granada and León. Whereas the style of the original development of Granada and León reflected classical colonial Spanish approaches because they were put in place under direct intervention from the King of Spain and his advisors/technicians in Spain, the original design of Masaya was more representative of a fusion of classical colonial Spanish approaches and those of people born in Nicaragua, influenced by the realities of Nicaraguan landscape and climate and the building materials available in Nicaragua.

The layout of the city of Masaya is not the result of a classical colonial Spanish masterplan imposed from Spain, as is the case in Granada and León. However, the influence of the grid layout which were part of these classical Spanish designs is retrained in Masaya's layout. The large majority of Masaya's housing stock was constructed since Nicaragua's independence from Spain in 1821 - more buildings dating from before this time survive in Granada and particularly León. In addition, there has been extensive housebuilding in Masaya much more recently than 19th century, for example in the 1950s and 60s, and the city has grown significantly since the early 1980s.

Masaya occupies mainly flat land directly to the east of the Masaya lagoon, the lagoon obviously being an absolute restriction to the city's growth in that direction. The only really feasible direction in which significant further urban development can take place is to the North East where flat land extends towards the river Tipitapa. To the south of Masaya the land is inclined as it approaches the highlands of the Carazo area and to the east the land also rises towards the Apoyo Lagoon which separates Masaya from Granada. Due north of Masaya is the steep Coyotepe hill on which is located the infamous and now defunct Coyetepe prison. In this direction housing currently extends to the base of the hill.

The department of Masaya has the highest population density of any department in the country including Managua. The city of Masaya is the closest of Nicaragua's secondary cities to Managua – it is located only a 30-45min bus ride south east of the capital's downtown area and as such the two cities have a unique migratory relationship, with many of Masaya's people travelling daily to Managua for work or study. The Urban Development Master Plan for the city of Masaya 2004 – 2024 (Alcaldía Municipal de Masaya, 2005) describes the significant historical and recent migration to Masaya from rural areas, something which has influenced the urban character and the culture of the city.

Masaya is also known throughout Nicaragua as a city with a strong and enduring indigenous identity and the city has long been associated with the production and commerce of traditional handicrafts and artwork. Items produced in the city can be found for sale all over Central America and people continue to migrate to Masaya to work in this industry.

Masaya also has a C2C cooperation partnership with a Dutch City - Nijmegen in the case of Masaya. In common with other case study cities this is part of an overall network of city twinning arrangements between the Netherlands and Nicaragua - thirteen Nicaraguan cities are twinned with Dutch cities in total. As with León-Utrecht, the Masaya-Nijmegen arrangement has been active in urban development policy and planning. The partnership assisted Masaya Council to form the Urban Development Master Plan for the city of Masaya 2004 – 2024 (Alcaldía Municipal de Masaya, 2005).

The Urban Development Master plan (2005) describes how Masaya continues to experience ‘a high rhythm of urban population growth due to migration from rural areas to the city’ (p.137). According to the document, this growth has led to a disordered pattern of settlement growth in the city, creating areas of settlement in which, as the plan describes, there has been a resultant breakdown in municipal administrative control. In addition, such areas have faced pressure in the provision of ‘basic services’ (p.137), damage to their local environment and even an increased vulnerability to the effects of volcanic eruptions and/or earthquakes.

In notable contrast to the policy approach of the national Nicaraguan government - outlined in the National Population Policy – whereby the growth of secondary cities is encouraged, the Masaya master plan states that a desirable situation would be one where the rate of population growth in Masaya is reduced so that the problems described above can be avoided. In a situation where migration to Masaya was reduced the master plan sees more potential for regulatory town planning to be successful at ‘order[ing] the city’ (p.137) through the development of social and physical infrastructure resulting in a reduced incidence of local environmental problems. The Masaya master plan also identifies a desire to conserve the ‘cultural identity, customs and ancestral traditions’ (p.138) which distinguish the city from others in Nicaragua. The desire to ‘retain culture’ is not explicitly linked in the document with the desire to restrict the city’s population growth. However, the master plan gives to the reader the sense that the city’s authorities are concerned that the high levels of in-migration which the city has experienced in recent decades are potentially having undesirable effects, including endangering the sense of cultural identity in the city, and as a result the levels of in-migration should be controlled.

The master plan also identifies some of the principal reasons for the current relatively high immigration rate affecting the city. These are: the availability of jobs in the city, particularly in the commercial and artisanal sectors; the presence of ‘natural and tourist resources’ (p.28) in and around the city which also create opportunities for employment; and the operation of housing programmes within the city which allow people to acquire land and/or real estate, combined with the fact that price of land/real estate – and cost of life generally – are lower in Masaya than other cities in Nicaragua. The city’s low cost of living is especially important as a migration pull factor when prices are compared with Managua, whose downtown area is located within a 30-45 min bus ride away. The master plan also discusses emigration as well as immigration with respect to the city of Masaya and lists some common causes for movement away from the city. However, it claims that there is currently very little emigration and this has not been a significant phenomenon in recent decades.

In the section of the master plan that describes the city in terms of its existing urban design the comparison is made between the characteristics of 'traditional' (Alcaldía Municipal de Masaya, 2005) housing in the city, built before the country's 1979 popular revolution – and before large scale migration to the city from rural areas – and the characteristics of housing found in areas which developed after the revolution and which have provided accommodation for families who moved to the city from rural areas during this time. Traditional housing was constructed continuing the Spanish colonial style using adobe and often arranged around central courtyards whereas the later housing type, according to the document, demonstrates a 'new typology of construction / architecture' (Alcaldía Municipal de Masaya, 2005) with individual detached houses located within their own small pieces of land.

No informal settlements have been established in Masaya over the past decade. The city's local government has managed to work well with international cooperation organisations over the last 10 years, and a number of areas of formally developed housing have been built through such cooperation and are occupied by low and middle income families.

4.4.4 Matagalpa

Matagalpa is located approximately 130 km north of Managua, a journey that can be completed mostly along the well maintained Pan American Highway. Together with Masaya, Matagalpa is one of the cities established during the second wave of urban development in Nicaragua during colonial times. As is the case with Masaya, the city does not feature the 'colonial blocks' which are commonplace in the historic centres of Granada and León. Colonial blocks are extremely large and formed part of the standard design, approved by the King of Spain, for the layout of cities considered important in the Spanish Americas in the 16th century. In their original design, colonial blocks were mainly composed of a series of large individual residential plots, with the buildings on each plot meeting the buildings on neighbouring plots to form a stylistically relatively uniform street facing facade. Large interior courtyards - often more than one per residence - were a regular feature of such blocks. Colonial blocks were particularly a feature of cities established in the early part of the Spanish presence in the Americas.

The majority of Matagalpa's housing stock was constructed after Nicaragua's independence from Spain in 1821. A great deal of housing in Matagalpa's suburbs has been constructed since the early 1980s.

Matagalpa is located at a height of approximately 600 to 700 metres above sea level. Highland areas surrounding the city exceed 1400m in height and provide climatic conditions that are ideal for growing the high-quality Arabica coffee bean. The influence of the coffee industry on the city of Matagalpa is enormous, as is the influence of the German migrants who arrived in Matagalpa in the 19th and early 20th centuries to cultivate the crop. Coffee cultivation, processing and trade in the product forms a central part of the economy of the city of Matagalpa and its surrounding rural areas.

Of the four case study cities in this study, Matagalpa is the most spatially restricted in terms of urban growth opportunities. The city is located in a steep sided valley formed by the Rio Grande de Matagalpa and there is a severe shortage of vacant flat land that is not steeply inclined in and around the city. On either side of the valley, and also at the head and foot of the part of the valley in which Matagalpa is located, the land inclines restricting opportunities for building. Existing areas of housing cover some of the steep inclines extending in each direction from the city centre and much of this housing is placed under serious threat from flooding during each rainy season. The most treacherous hillsides, in terms of threat from flooding, are occupied by informal settlements which have been established in the last 20 years, some having been established in the past 2 years. Of the small amount of vacant land in and around Matagalapa that is not steeply inclined, much is floodplain land, some of which is used as community green space including playing fields.

The department of Matagalpa has the largest population of any department after Managua and the city of Matagalpa is its largest city. The department is very large in area (second only in size to Jinotega if the 2 Caribbean Coast autonomous regions are excluded). The departments of Jinotega and Matagalpa were among the areas most affected by fighting during the Revolutionary War (1974-1979) and the Contra War of the 1980s. Both departments also suffered greatly because of the coffee crisis which began in 2001/2002 – the price of coffee beans in the world market fell sharply and as a result people lost their income and their employment. In some areas there has also been famine as over recent decades there has been a growing preference for farmers to use all available land for growing coffee at the expense of cultivating crops for food. As a result of these issues, Jinotega and Matagalpa have experienced relatively volatile patterns of migration since 1974, and particularly since the completion of the country’s popular revolution in 1979.

The document entitled the Second Stage Action Plan for the Strategic Plan for Departmental Development (Alcaldía Municipal de Matagalpa, 2004) describes, among other things, the way in which particularly the post-2001 coffee crisis has resulted in people in the department of Matagalpa migrating from rural to urban areas. Many rural inhabitants in the department were coffee workers in the department's coffee plantations and as a result of the crisis they lost their jobs. The action plan identifies 'migration from rural to urban areas' (p.37) as a problem which has led to increased poverty in the city of Matagalpa and the growth of 'spontaneous settlements' (p.37) in the city in a 'disordered' (p.37) manner. Therefore, in a similar way to local government policy documents in Masaya this policy document contradicts the national government's National Population Policy and its call to encourage development and population growth in secondary cities because of the positive consequences of doing so.

The departmental government representing the department of Matagalpa produced the document entitled the Strategic Plan for Departmental Development (Matagalpa, 2004). Section 6.2 of the document is headed 'Population: Settlements and Urbanisation' and describes how the department of Matagalpa saw a very high rate of population growth of 12.8% from 1995 – 2000. The document also reports that the population of the city of Matagalpa grew from 109,313 in 1995 to 130,028 in 2000, this being a growth rate of 18.95% - the second highest municipal population growth rate in the department after Rio Blanco, a logging town in the east of the area. The strategic plan concedes that because these population figures are limited to the period 1995 – 2000 they do not provide a picture of population dynamics during and after the coffee crisis which started in 2001/2002. In fact, other sources describe how the coffee crisis led to increased rural to urban migration within the department, including to the city of Matagalpa. However, they do not provide numerical figures to quantify this.

Matagalpa is in a similar situation to Granada in that its relationship with the Dutch city with which it is twinned has now completely broken down and is inactive. Matagalpa had a twinning relationship with the city of Delft but unlike the 'actively C2C assisted cities' of León and Masaya, Matagalpa's current urban planning and housing operations are unaffected by the city of Delft.

After the immense devastation caused in and around the city of Matagalpa caused by Hurricane Mitch in 1998, a number of international relief organisations, including the Red Cross and Habitat for Humanity, rehoused families from the city of Matagalpa made homeless by the hurricane in a series of 'new towns.' These new settlements are situated in an area south of Matagalpa separated from the city by a number of highland peaks. It is unclear, how much involvement there was in this process from Matagalpa's local municipal government - or whether the primary governmental point of contact for these relief organisations was at a national level. Since the building of these new towns there appears to have been no housing built through cooperation between the city's local government and international cooperation organisations of any type.

Matagalpa and Granada are the only cities of the four case study sites to have seen recent development of new areas of informal housing, with both cities having seen significant informal housing development over the last 10 years, including in the last 2-3 years.

Chapter 5. Developing a housing typology

5.1 Identifying formal sector housing types

TYPES A1 to A6 were planned and built using formal means, i.e. each of the following elements of planning and building were done legally and through the appropriate formal planning/bureaucratic processes: obtaining the land for the housing, achieving planning permission for the development of the land, meeting legislation which imposes minimum criteria for housing standards (this last element is relatively unrigorously enforced across Nicaragua and to avoid categorising all Nicaraguan housing as informal this element is interpreted flexibly)

All TYPES are made up of single-storey dwelling structures unless otherwise stated.

5.1.1 TYPE A1

Type A1 is historic colonial style housing located in the central urban area with no significant subdivision (figures 5.1, 5.2, 5.3 and 5.4 illustrate this housing type). In most cases the different dwellings in a block are clearly distinguishable from each other by the colour of their facades. The footprint of each dwelling has seen very little change from when the blocks were established during colonial Spanish rule. There has not been significant sub-division of the original structures. Some of the dwellings stretch from one side of the block to the other and possess 2 courtyards.

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Figs.5.1 and 5.2. Photographs showing a type A1 test site in central Granada (photographs, Morton 2010).

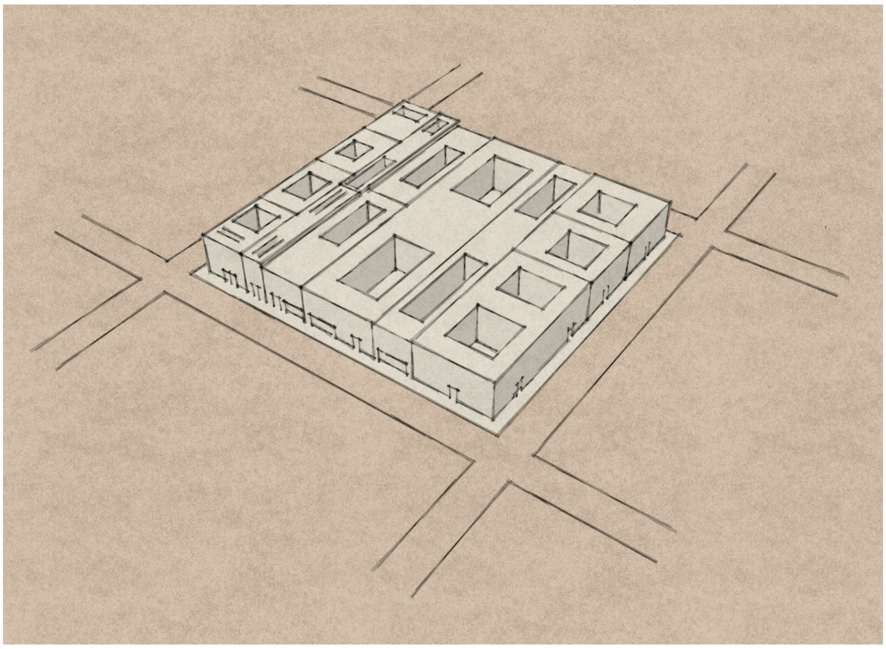


Fig.5.3. Sketchup diagram representing the layout of individual dwellings within a notional type A1 housing block. (Sketchup diagram, Morton 2011).

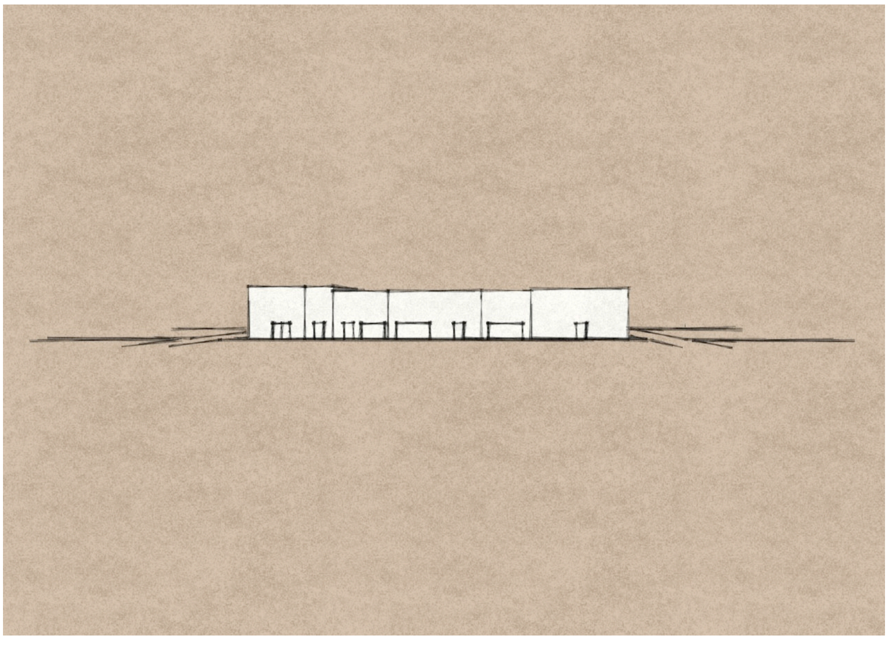


Fig.5.4. Sketchup diagram showing the side on/ground level view of the same notional type A1 housing block as in fig.15 (Sketchup diagram, Morton 2011).

5.1.2 TYPE A2

Type 2 is historic colonial style housing located in the central urban area of the secondary cities with significant subdivision of the original structures (figures 5.5, 5.6, 5.7, 5.8 and 5.9 illustrate this housing type). In this type some dwellings retain the original uniform height of the facade and also feature the same original decorative features at the base of the façade that were a feature of original construction. In other parts of type A2 housing blocks, neighbouring individual dwellings produced by subdivision have developed over time into units with differing heights of façade.

Individual dwellings, formed as a result of subdivision are often distinguishable from each other, as far as the facade is concerned, by wall colour, installation of windows and changes to materials used for the roofs of some of the properties.

It is very rare for dwellings in type A2 housing blocks to stretch from one side of the block to the other and many of the original courtyards within blocks have been subdivided between neighbouring dwellings. In some cases neighbouring dwellings formed through subdivision share what was originally, before subdivision, a single larger doorway.

Fig.5.5. Photograph showing a type A2 housing block in central León (photograph, Morton 2011).

Fig.5.6. Photograph showing the same type A2 housing block in central León as in fig. 17 (photograph, Morton 2010).

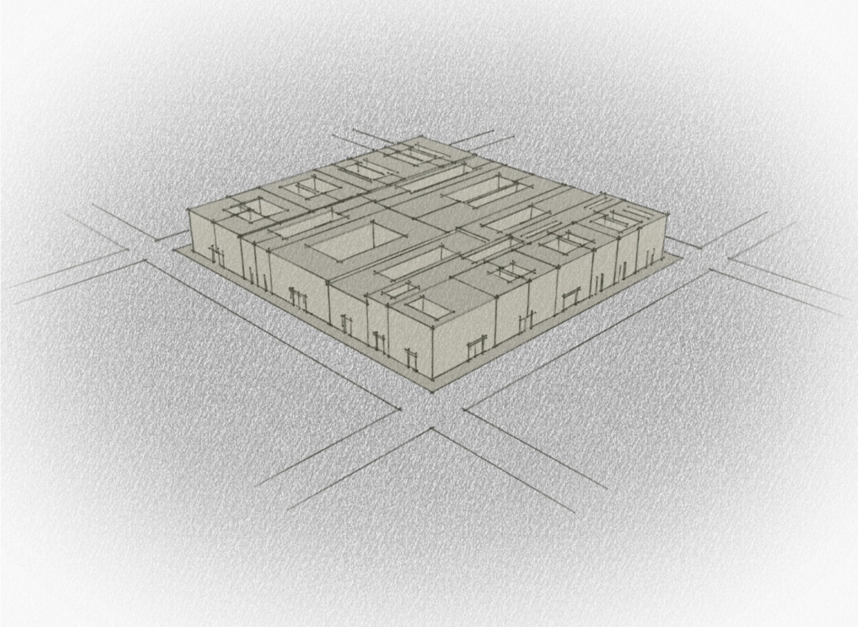


Fig.5.7. Sketchup diagram representing the layout of individual dwellings within a type A2 housing block. This diagram is of a notional housing block and is intended to provide a comparison to the type A1 Sketchup diagram. (Sketchup diagram, Morton 2011).

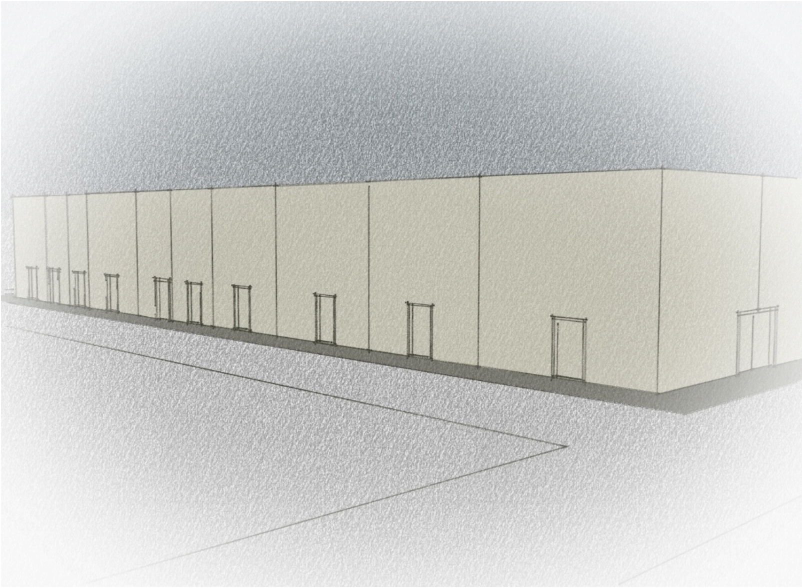


Fig.5.8. Sketchup diagram showing the side on/ground level view of individual dwellings within a type A2 housing block. This diagram is of the same notional housing block as in fig.5.7 and again is intended to provide a comparison to the type A1 Sketchup diagrams. blocks (Sketchup diagram, Morton 2011).

Fig.5.9. Photograph showing part of an A2 housing block in central Granada. In this part of the block a foreign NGO developed a number of dwellings for low income families from a structure which was once a single unoccupied and dilapidated dwelling (photograph, Morton 2010).

5.1.3 TYPE A3

This type comprises modern (mostly built from approximately 1970 onwards) areas of housing that have been masterplanned and built as a single project, made up of detached housing units, occupied by low-income families and mainly located in peripheral urban areas (figures 5.10, 5.11, 5.12, 5.13, 5.14 and 5.15 illustrate this housing type).

Each residential structure contains a single dwelling unit in areas of type A3 housing and each structure is detached from its neighbours. Residential structures are located within their own housing plots and are generally not built up to the edges of the plots. As a result, dwelling structures have private outside space surrounding them and the amount of space is often considerable. Buildings often have generous private outside space to each side. In many areas of type A3 housing dwellings have generous private outside space located to their rear and this creates housing blocks with significant amounts of outside space in their centre.

Sometimes there is also substantial space separating the edges of neighbouring plots – this not being private outside space as it is not located within plots.

Areas of type A3 housing often have relatively wide access roads with large verges – which are generally noted not to have any cars on them (car ownership in Nicaragua is very low and is extremely low in areas of type A3 housing).

Fig.5.10. Photograph showing a type A3 housing block in a peripheral area of León. 3 neighbouring individual housing units are visible which are located along a single access road. (photograph, Morton 2010).

Fig.5.11. Photograph showing part of the same type A3 housing block as in fig.5.10. The closest housing unit in the image is located on a corner of the block (photograph, Morton 2010).

Fig.5.12. Photograph showing part of the same type A3 housing block as in figs.5.10 and 5.11. The closest housing unit in the image has neighbouring units on both sides and to the rear (photograph, Morton 2010).

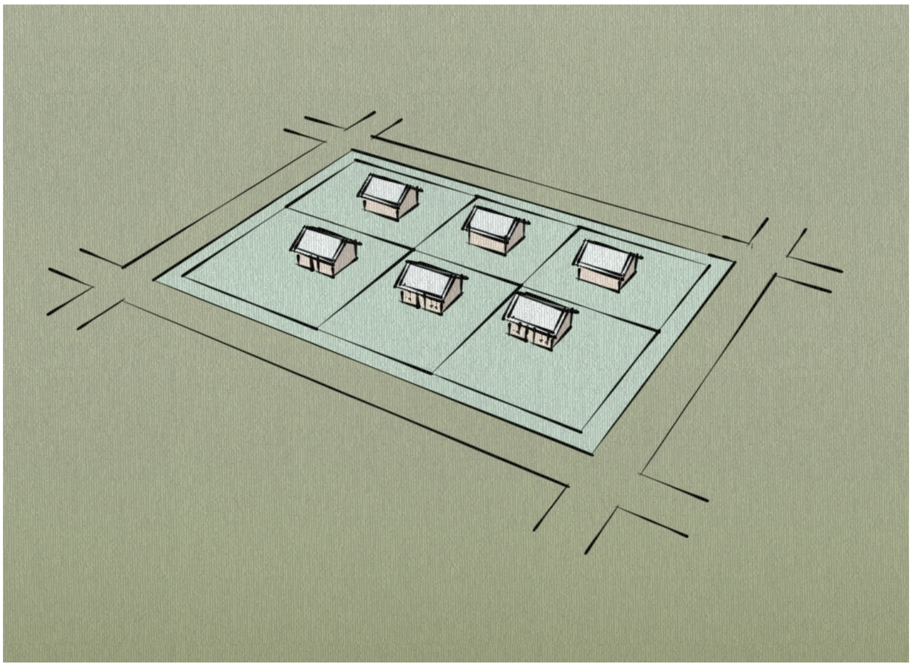


Fig.5.13. Sketchup diagram representing the layout of individual dwellings within a notional type A3 housing block. (Sketchup diagram, Morton 2011).

Fig.5.14. Sketchup diagram representing the layout of individual dwellings within the same notional type A3 housing block as in fig.5.13 (Sketchup diagram, Morton 2011).

Fig.5.15. Photograph part of an area of type A3 housing in a relatively central area of Granada. (photograph, Morton 2010).

5.1.4 TYPE A4

This housing type is modern (mostly built from approximately 1990 onwards) detached housing, occupied by high-income families and located in peripheral urban areas (figures 5.16, 5.17, 5.18 and 5.19 illustrate this housing type)

The plot sizes are very large in size. In fact, many plots within this housing type are so large that the photographs used here as figures are unable to capture their complete dimensions. Housing structures on the plots are never built up to edges of the plots. All of the dwellings in this type feature large amounts of private outside space within the plots.

A very small number of housing structures belonging to this type are built on more than a single storey and are therefore very rare in Nicaragua.

In many places in areas of type A4 housing there are large amounts of unused land outside of housing plots. Some of this land may become part of future housing plots, while other unused spaces are likely to remain so permanently, simply being, for example, a continuation of a road verge or separating one housing plot from another

Fig.5.16. Photograph showing a vacant type A4 housing plot in front of a number of occupied plots. This area of type A4 housing is located in a peripheral area in Granada (photograph, Morton 2010)

Fig.5.17. Photograph showing occupied plots in the same area of type A4 housing as in fig.5.16 (photograph, Morton 2010).

Fig.5.18. Photograph showing occupied plots in the same area of type A4 housing as in figures 5.16 and 5.17 (photograph, Morton 2010).

Fig.5.19. Photograph showing part of the same type A4 housing block as in figs.5.16 to 5.18. The image shows part of a vacant housing plot (photograph, Morton 2010).

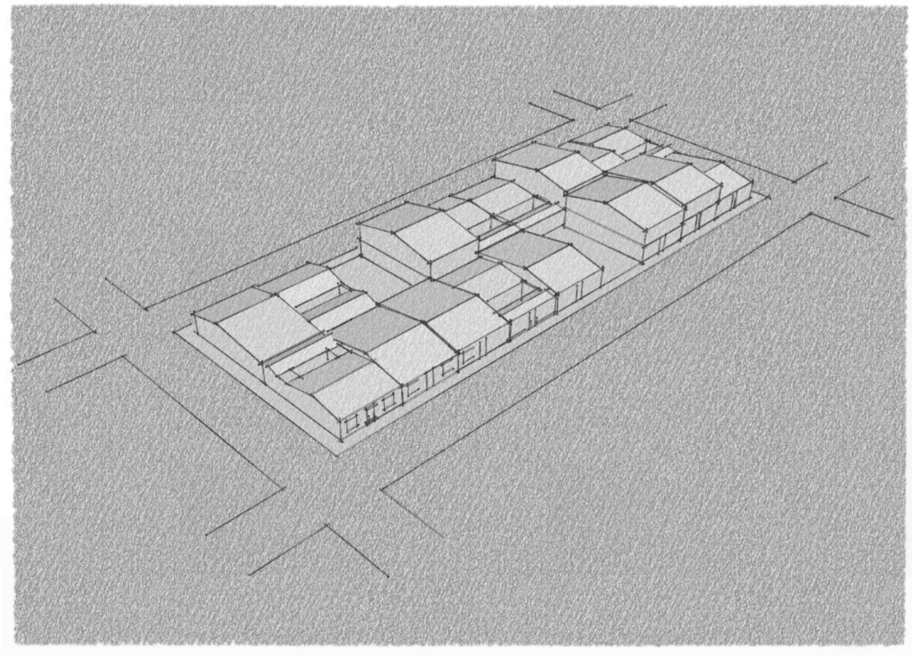
5.1.5 TYPE A5

This housing type is modern (mostly built from approximately 1980 onwards) terraced housing, including areas of back-to-back housing, occupied by low and middle-income families and located in peripheral urban areas (figures 5.20, 5.21, 5.22, 5.23 and 5.24 illustrate this housing type)

Occasionally, vacant plots are found within type A5 housing blocks and, in addition, a small proportion of dwelling units are extended vertically to create a 2nd storey. Some dwellings feature small private outside spaces/courtyards enclosed within the individually occupied housing units.

Access roads are often wide and are generally noted to be relatively underused by cars.

Fig.5.20. Photograph showing part of 2 adjacent type A5 housing blocks (photograph, Morton 2010).



Figures 5.21 and 5.22. Sketchup diagrams representing the layout of individual dwellings within a notional type A5 housing block. (Sketchup diagram, Morton 2011).

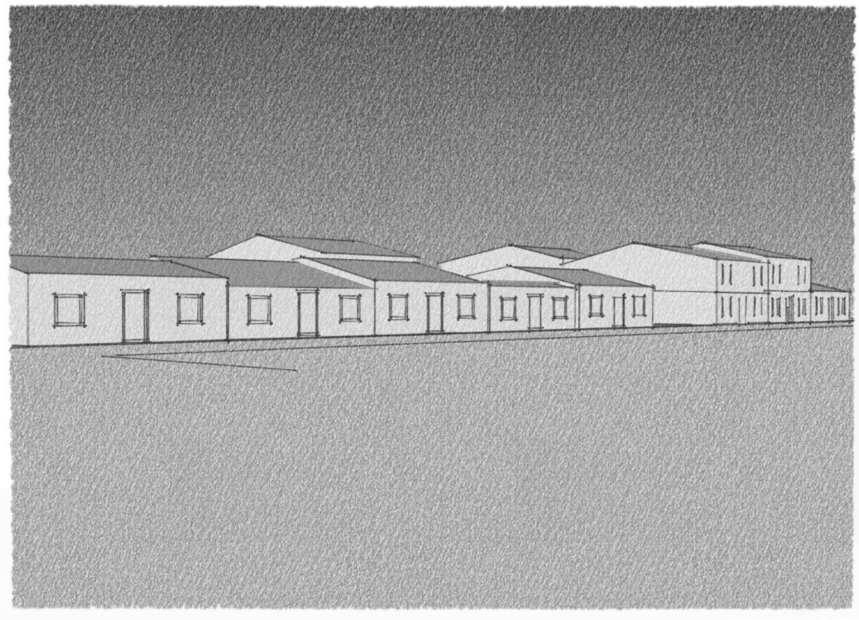


Fig.5.23. Photograph showing part of a type A5 housing block in a peripheral area of Masaya. (photograph, Morton 2010).

Fig.5.24. Photograph showing part of a type A5 housing block in a peripheral area of Matagalpa. (photograph, Morton 2010).

5.1.6 TYPE A6

This housing type comprises modern (mostly built from approximately 1980 onwards) areas of housing that have been master planned and built as a single project, comprising multi-storey dwelling structures, occupied by low-income families and located in central and peripheral areas

TYPE A6 is split into 2 ‘sub-types,’ A6a and A6b. They are detailed below:

5.1.6.1 SUB-TYPE A6a

This housing sub-type consists of areas of housing in which all units were planned and built as 2-storey structures, with each structure occupied by a single family (figures 5.25 and 5.26 illustrate this housing type).

Each housing structure is detached from neighbouring structures. Structures are generally separated from each other by relatively large areas of private outside space. Housing is often served by relatively wide access road, which are generally noted as being relatively unused by cars.

Fig.5.25. Photograph showing part of a type A6a area of housing in a peripheral area of León (photograph, Morton 2010).

Fig.5.26. Photograph showing part of a type A6a area of housing in a peripheral area of León (photograph, Morton 2010).

5.1.6.1 SUB-TYPE A6b

This housing sub-type is made up of areas of housing in which all units were planned and built as structures with 3 or more storeys, with each structure divided up into multiple single family dwelling units (figures 5.27, 5.28 and 5.29 illustrate this housing type)

Balconies are often part of the structure of the buildings and where they feature are shared space as part of a building’s stairwells.

It is noted that some families occupying ground floor dwelling units have occupied what was originally designed to be shared outside space as their own private outside space. In some cases, families occupying ground floor units have set up shops using the units, sometimes involving informal horizontal extensions made to the ground floor of a building. This is done to provide the shop with additional space.

Sometimes, sub-type A6b housing structures are surrounded by relatively large pieces of unused space which was not planned to be private or community space.

Fig.5.27. Photograph showing 2 type A6 housing blocks in a peripheral area of León. Each housing block comprises 6 dwelling units, each occupying a single family (photograph, Morton 2010).

Fig.5.28. Photograph showing 2 type A6 housing blocks in the same peripheral area of León as in fig.5.27 (photograph, Morton 2010).

Fig.5.29. Photograph showing 2 type A6 housing blocks in a central area of Matagalpa. Each housing block comprises 8 dwelling units, each occupied by a single family.

5.2 Identifying informal housing types

Housing types A7 to A8 were planned and built using informal means, i.e. at least one of the following elements of planning and building was done illegally and not through the appropriate formal planning/bureaucratic processes: obtaining the land for the housing, achieving planning permission for the development of the land,

As was mentioned above, there is another element to the formal/informal housing dynamic - that of meeting legislation which imposes minimum criteria for housing standards. However, this last element is relatively unrigorously enforced across Nicaragua and to avoid categorising all Nicaraguan housing as informal this element is interpreted flexibly here. The main way in which the informal housing mentioned here is different from the formal housing in terms of meeting criteria for housing standards is in the building materials used. The formal housing meets the minimum criteria but the informal housing does not. In Nicaragua, the majority of what is termed here informal housing is built from a mixture of irregular pieces of wood, plastic or other ‘recycled’ materials.

All informal housing types are made up of single-storey dwelling structures unless otherwise stated.

5.2.1 TYPE A7

This housing type comprises newly established (mostly built from approximately 2006 onwards) areas of informal housing, occupied by low-income families and located in peripheral areas (figures 5.30, 5.31, 5.32, 5.33 and 5.34 illustrate this housing type).

Often, relatively large amounts of vacant space are found between housing plots and structures. Within plots there are often relatively large areas of private outside space.

Very wide unpaved access roads with large verges are often a feature of type A7 areas of housing – on which, on the whole, no cars can be seen.

Fig.5.30. Photograph showing part of an area of type A7 housing in a peripheral area of Granada. The area was established approximately 1 year before the photographs were taken. (photographs, Morton 2010).

Fig.5.31. Photograph showing part of the same type A7 area of housing as in fig.5.30 (photograph, Morton 2010).

Fig.5.32. Photograph showing part of the same type A7 area of housing as in figures 5.30 and 5.31 (photograph, Morton 2010).

Fig.5.33. Photograph showing type A7 housing in a peripheral area of Matagalpa. The area was first established approximately 4 years before the photograph was taken (photograph, Morton 2010).

Fig.5.34. Photograph showing part of the same area of type A7 housing as in fig.5.33. (photograph, Morton 2010).

5.2.1 TYPE A8

This housing type consists of established (mostly built from approximately 1970 onwards) area of informal housing, occupied by low-income families and located in central and peripheral areas (figures 5.35 and 5.36 illustrate this housing type)

Housing plots often include large areas of private outside space and areas of housing often feature wide access roads with large verges. It is generally noted that these roads are relatively unused by cars.

Fig.5.35. Photograph showing part of an area of type A8 housing in a central area of Masaya. The area was first established during the 1970s. (photograph, Morton 2010).

Fig.5.36. Photograph showing part of the same area of type A8 housing as in fig.5.35. In the foreground, a large housing plot is visible with a housing structure on and featuring a large amount of private outside space (photograph, Morton 2010).

5.3 Extending the housing typology model with net residential density data

5.3.1 Developing a framework from literature with which to interpret density data for each housing type

In this section, definitions of optimum urban net residential density from existing academic literature are used to establish density 'bands' to assist in the analysis of the density data for the 8 housing types

The table below in fig. 5.37 summarises the current best attempts of the international academic community to define optimum urban net residential densities for a variety of 'urban sustainability scenarios' for use as an international c or other literature published indicating optimum densities in Nicaragua. In the literature the figures are expressed in persons per hectare (pph). In this thesis densities are measured in dwellings per hectare (dph). Earlier on in this thesis, the case was made for using dph as units for measuring density. In order to make use of the optimum urban net residential densities presented here to aid data analysis, in this study they must be expressed in dph. In order to do this data on numbers of inhabitants per dwelling is required. In the literature review in this thesis, this calculation was described in detail along with a justification for why the UK mean average number of persons per household was used in the calculation.

So, in summary, the table below in fig. 5.37 shows the current best attempts of the academic community to define optimum urban net residential densities for use as an international guide (Fulford, 1996) in pph and also converted into dph.

Fig.5.37.

Optimal net residential density to enable	Density (in pph)	Density in dph (based on UK mean average persons per household)
Public transport	90 - 120	38 - 50
Walking	300	125
Sustainable urban	225 - 330	94 - 138
Central/accessible urban	Up to 370	Up to 154

In order to make it possible to analyse the density results obtained in this study, the author has set out ‘bands’ which propose the range of net residential densities (in dph) which should apply to each of the following: low-density housing, medium-density housing and high-density housing. The bands were developed based on the optimum densities (in dph and converted from pph using the figure for mean average number of persons per household in the UK) given in the table above. The bands were calculated to reflect the thinking demonstrated in the literature in which the optimum densities were established. These bands reflect an international perspective on density. The author considers it important to achieve this international rigour in this work on Nicaragua rather than using bands which solely reflect the Nicaraguan state of mind on density in a rather parochial way. By taking an international perspective the results and discussion are more transferable and comparable internationally.

In the UK, it is reasonably well established in planning policy that net residential densities below 30 dph are considered low and are discouraged by regulatory planning authorities. (Fulford, 1996) has written of the damage caused by low-density residential development. In addition, the optimum densities established for different ‘sustainability scenarios’ and summarised in the table in fig.5.37 when expressed as dph using the UK average number of people per household all exceed 30 dph. Based on this, for the purposes of this thesis, 30 dph is set as the upper limit of the ‘low-density band.’

Friends of the Earth UK (Friends of the Earth, 2011) ‘advocates high development densities as an important part of achieving sustainable communities.’ Fulford’s (1996) optimum density for ‘sustainable urban‘ development is based on work by

Friends of the Earth and has a range of 94 - 138 dph. Based on the principles promoted by Friends of the Earth it can therefore be said that densities of more than 94 dph are high. For the purposes of this thesis and for greater clarity, this figure will be rounded to the nearest number divisible by 5. Therefore, the upper-limit of the ‘medium-density‘ band will be 95 dph.

The assertions on optimum density made above allow 3 density bands to be established as indicated in the table below in fig.5.38.

Density category	**Range of net residential densities (in dph)**
Low-density	less than 30
Medium-density	30 - 95
High-density	more than 95

Fig.5.38 Table showing the author’s calculation of the bands of densities that should be used to classify areas of housing as low, medium and high-density for the purposes of this thesis. This is based on the international guide figures for optimum densities as expressed in dph.

5.3.2 Possible drawbacks in the approach described above for developing a framework from literature with which to interpret density data for each housing type

Fulford’s work on optimum densities (Fulford, 1996), the work he based this on (Newman and Kenworthy, 1989) (Friends of the Earth, 2011) and the average figure for people per dwelling used to convert pph into dph (Office for National Statistics, 2011) were all developed in economically developed countries, reflecting the urban environment of developed countries. It is acknowledged that the extent to which this work satisfactorily represents the context of developing countries is limited. However, as was noted earlier in this thesis in the literature review chapter there is a lack of work covering the same area in developing countries. In the absence of this, the author considers that the best way of carrying this PhD research forward in Nicaragua, a developing country, in this particular aspect is to use expertise from developed countries. It is hoped this research can develop increased knowledge of the topic and the context of urban densities as they apply specifically to developing countries.

It should be noted that the figure for the UK's average number of people per dwelling, whose use has been explained above to convert between pph and dph, applies to all housing across the country, including in rural and urban areas. After researching the options available for providing a representative UK figure the author deduced that the figure used was the most ideal. It is the most widely used and best respected way of representing the number of people per household in the UK.

As has been mentioned, the optimum densities summarised in the table above represent international academia's best attempt so far to define optimum net residential densities for various 'sustainable urban scenarios,' such as the general conditions of 'sustainable urban' development and conditions where public transport or walking are enabled as mobility strategies for residential areas. However, it has also been noted by the author that a weakness with these definitions is that they use both figures for minimum densities (e.g. 300 pph minimum to make walking a viable mobility strategy in a community) and ranges of density values (e.g. 90 - 120 pph for enabling the use of public transport). This introduces some confusion and uncertainty.

For the purposes of this thesis, the author has used both the figures for minimum densities and the ranges of density values as indications of the minimum densities required to enable the scenarios discussed (e.g. walking, public transport use, sustainable urban environment). It is acknowledged that notional upper limits for densities apply, i.e. although higher densities can improve urban sustainability if densities are excessively high this can bring damaging negative externalities. Nevertheless, in Nicaragua the author's scoping research has clearly identified that there are certainly no problems with densities being too high and there is also no foreseeable likelihood of excessive densities becoming a problem. Rather the problem is with densities being too low. Care must be taken though to ensure that if any attempts were to take place in Nicaragua to increase residential densities that the legacy were not excessive densities bringing negative externalities.

5.3.3 The net residential density data and its interpretation by housing type

Note: the housing density test sites are arranged within each housing type in the tables in this section from the test site with the lowest density to that with the highest

5.3.3.1 TYPE A1

This housing type is historic colonial style housing located in the central urban area with no significant subdivision.

5.3.3.1.1 DENSITY DATA (fig.5.39)

Location of residential block used as density test site	**Net residential density of density test site (in dwellings per hectare (dph))**	**Number of dwellings in density test site**	**Area of residential block used as density test site (in hectares)**
Granada	6	10	1.63
Granada	10	31	3.01
Granada	17	37	2.22
Granada	18	44	2.51
Granada	19	24	1.28
León	19	45	2.31
Mean average density (in dph)	**Standard deviation for the densities (in dph)**		**Standard deviation for the areas of the residential blocks (in hectares)**
15	5		0.62

5.3.3.1.2 DISCUSSION OF THE TYPE A1 HOUSING DENSITY DATA

The housing density calculations for the 6 type A1 test sites reflect that this housing type is comprised entirely of low-density housing. The density figures for all 6 sites are less than 30 dph and the mean average for the 6 sites is 15 dph.

The standard deviation for the measurements is 5 dph and this figure is the 3rd lowest of all the formal housing types. The lowest 3 figures for housing types' standard deviation are grouped significantly lower than for any of the other types. Type A1's relatively low standard deviation means that the densities of the type's test sites are grouped reasonably close together. This makes the mean average density figure more representative of the test site sample and means it is possible to say with more conviction that the type is a 'low-density type.'

The mean average density and all 6 individual measurements for type A1 are very far below all of the optimum densities for the different 'sustainability scenarios' as given earlier on, except for the lower limit of the range for housing density to enable the use of public transport.

In terms of the numbers of people occupying type A1 dwellings, numbers are very often low in comparison with the figures for other housing types in the country. This is related to the fact that families occupying type A1 dwellings have high-incomes and family income in Nicaragua is roughly inversely proportional to the number of people occupying a family home. This is in spite of the fact that type A1 dwellings generally have large floor areas. To sum up, this means that the actual numbers of people living communities with large numbers of type A1 dwellings are actually perhaps even lower than the density in doh would suggest. With relatively low occupancy of large dwellings in the A1 type the dph figure required to enable the different ‘sustainability scenarios’ indicated by the optimum densities such as walking and public transport may actually be higher. As there are generally less occupants in type A1 dwellings than in dwellings belonging to other housing types greater dph densities are required to reach the threshold for numbers of people to make public transport and other urban functions viable.

The standard deviation in the area of the residential blocks used as the density test sites for housing type A1 is relatively high as compared to the other housing types. This indicates there is comparatively high variation in the area of the housing blocks. The housing blocks in question all occupy block sites which are the same as those originally established when the areas of housing were first built during the times of colonial Spanish rule. It is known that the dimensions of the blocks established during this time in Granada and León did vary in order to respond to the local topographical characteristics such as the course of rivers and inclined land.

5.3.3.2 TYPE A2

This housing type is historic colonial style housing located in the central urban area with significant subdivision

5.3.3.2.1 DENSITY DATA (fig.5.40)

Location of residential block used as density test site	**Net residential density of density test site (in dwellings per hectare (dph))**	**Number of dwellings in density test site**	**Area of residential block used as density test site (in hectares)**
León	23	49	2.16
Masaya	23	15	0.65
Masaya	24	28	1.18
Granada	26	60	2.27
León	26	45	1.7
León	27	38	1.43
León	27	82	3
León	28	64	2.28
León	28	51	1.82
Masaya	28	23	0.81
Matagalpa (occupied by high-income families)	30	22	0.73
Masaya	31	30	0.97

Location of residential block used as density test site	Net residential density of density test site (in dwellings per hectare (dph))	Number of dwellings in density test site	Area of residential block used as density test site (in hectares)
Masaya	37	35	0.94
Masaya	37	40	1.09
Matagalpa (occupied by middle and low-income families)	37	50	1.33
Matagalpa (occupied by middle and low-income families)	38	32	0.84
León	39	92	2.37
Matagalpa (occupied by high-income families)	40	36	0.9
León	42	33	0.79
Matagalpa (occupied by high-income families)	42	27	0.65
León	44	62	1.42
Matagalpa (occupied by middle and low-income families)	46	52	1.12

Location of residential block used as density test site	**Net residential density of density test site (in dwellings per hectare (dph))**	**Number of dwellings in density test site**	**Area of residential block used as density test site (in hectares)**
Matagalpa (occupied by middle and low-income families)	48	43	0.89
Matagalpa (occupied by middle and low-income families)	54	47	0.88
Matagalpa (occupied by high-income families)	64	15	0.47
Mean average density (in dph)	**Standard deviation for the densities (in dph)**		**Standard deviation for the areas of the residential blocks (in hectares)**
36	10		0.66

5.3.3.2.2 DISCUSSION OF THE TYPE A2 HOUSING DENSITY DATA

The mean average density for type A2 is 36 dph which is medium density according to the density bands established earlier on. It is very close to the bottom of the medium density band. In fact, significantly more than half of the type A2 test sites have density readings which are above 30 dph but significantly below 95 dph and as such are classified as being of medium density.

The fact that the mean average net residential density for the A2 type is more than double that of the A1 type clearly shows that where there is ‘significant sub-division’ in a centrally located area of historic colonial style housing it very substantially raises density and achieves residential densification - from low to medium density.

The standard deviation for the type A2 density readings is 10 dph and as such is neither very low nor very high as compared to the other types. The fact that subdivision is done independently by owners of individual residential properties makes variation likely in the densities of different areas of type A2 housing. It is therefore not surprising that the figure for standard deviation for the densities of type A2 test sites shows signs of the sites varying relatively widely from each other in terms of their densities.

The net residential densities for 10 out of 25 of the type A2 test sites meet the minimum density identified from literature as being required to enable the use of public transport as a means of mobility in a residential area. None of the test sites have densities which fit within the range of densities which sources within academia (Fulford, 1996) have identified as being optimum internationally for creating 'sustainable urban’ areas. None of the A2 test sites has a residential density high enough to be considered by Fulford (Fulford, 1996) to enable walking as a mobility option. None of the test sites have densities which meet the minimum density value established by Fulford in order to be characterised as a ‘central/accessible’ urban area. In fact, all of the A2 test sites are located in central areas of the case study cities and the fact that their densities don’t meet the international ‘central/accessible’ minimums is just one of many signs that urban densities in the case study cities are low.

The standard deviation in the area of the residential blocks used as the density test sites for housing type A2 is relatively high as compared to the other housing types. This indicates there is comparatively high variation in the area of the housing blocks. The housing blocks in question all occupy block sites which are the same as those originally established when the areas of housing were first built during the times of colonial Spanish rule. It is known that the dimensions of the blocks established during this time in Granada and León did vary in order to respond to the local topographical characteristics such as the course of rivers and inclined land.

5.3.3.3 TYPE A3

This housing type is modern (mostly built from approximately 1970 onwards) areas of housing that have been masterplanned and built as a single project, comprising detached housing units, occupied by low-income families and mainly located in peripheral urban areas

5.3.3.3.1 DENSITY DATA (fig.5.41)

Location of residential block used as density test site	**Net residential density of density test site (in dwellings per hectare (dph))**	**Number of dwellings in density test site**	**Area of residential block used as density test site (in hectares)**
León Sureste, León	30	16	0.53
Barrio Adic Benanza, Matagalpa	30	10	0.33
Barrio Adic Benanza, Matagalpa	32	10	0.32
Barrio Adic Benanza, Matagalpa	33	20	0.6
Barrio Habitat, Matagalpa	34	18	0.52
Barrio Habitat, Matagalpa	34	10	0.29
Barrio Cruz Roja, Matagalpa	34	10	0.29
León Sureste, León	35	18	0.51
Barrio Cruz Roja, Matagalpa	36	14	0.38

Location of residential block used as density test site	**Net residential density of density test site (in dwellings per hectare (dph))**	**Number of dwellings in density test site**	**Area of residential block used as density test site (in hectares)**
Barrio Santa Emilia, Granada	39	23	0.58
Barrio Habitat, Matagalpa	40	16	0.4
Barrio Cruz Roja, Matagalpa	40	18	0.45
Barrio Santa Emilia, Granada	43	18	0.42
León Sureste, León	44	27	0.62
Barrio Santa Emilia, Granada	51	20	0.39
Barrio Salto Transatlántico, Masaya	68	20	0.29
Barrio Salto Transatlántico, Masaya	69	19	0.28
Barrio Salto Transatlántico, Masaya	72	16	0.22
Mean average density (in dph)	**Standard deviation for the densities (in dph)**		**Standard deviation for the areas of the residential blocks (in hectares)**
42	14		0.12

5.3.3.3.2 DISCUSSION OF THE TYPE A3 HOUSING DENSITY DATA

The mean average density for type A3 is 42 dph which is medium density according to the density bands established earlier on. It is well within the lower half of the medium density band. All of the type A3 test sites have density readings of 30 dph or above - and below 95 dph. As a result, all of the test sites in this housing type are classified as being of medium density.

The standard deviation for the type A3 density readings is 14 dph which is medium/high as compared to the other types. The A3 test sites are made up of blocks of housing planned and built by a wide range of different parties - mostly Nicaraguan central or local government, NGOs, international co-operation bodies or a combination. It is therefore not a surprise the densities of the different developments should vary in this way.

The net residential densities of approximately half of the type A3 test sites exceed the densities identified from literature as being the minimum required to enable the use of public transport as a means of mobility in a residential area. None of the test sites have densities which fit within the range of densities which sources within academia (Fulford, 1996) have identified as being optimum internationally for creating 'sustainable urban' areas. None of the A2 test sites has a residential density high enough to be considered by Fulford (Fulford, 1996) to enable walking as a mobility option. None of the test sites have densities which meet the minimum density value established by Fulford in order to be characterised as a ‘central/accessible’ urban area. In fact, all of the A3 test sites are examples of housing developments that were planned and built by Nicaraguan central or local government, NGOs, international co-operation bodies or a combination of these bodies to provide housing for low-income families - an income group within which there is huge demand for housing in all of the case study cities. The fact that their densities meet so few of the the international measures of optimum density from literature is a sign that the development of such areas of housing is not being done in an efficient way in terms of densities and ensuring that developments can make the biggest possible impact on housing demand by building in a sustainable way.

The standard deviation in the area of the residential blocks used as the density test sites for housing type A3 is low as compared to the other housing types. This indicates there is comparatively low variation in the area of the housing blocks. The housing blocks in question were built by varied parties in different cities but all to provide housing for low-income families and all were built since approximately 1970. It is rather a surprise that there is so little variation in the size of the blocks although the style and approximate dimensions of the dwelling structures built under type A3 are remarkably similar from one supplier to another and from one city to another.

5.3.3.4 TYPE A4

This housing type is modern (mostly built from approximately 1990 onwards) detached housing, occupied by high-income families and located in peripheral urban areas

5.3.3.4.1 DENSITY DATA (fig.5.42)

Location of residential block used as density test site	**Net residential density of density test site (in dwellings per hectare (dph))**	**Number of dwellings in density test site**	**Area of residential block used as density test site (in hectares)**
Reparto San Juan, Granada	1	9	6.7
Reparto San Juan, Granada	2	8	4.39
Reparto San Juan, Granada	3	8	2.56
Reparto San Juan, Granada	4	6	1.53
Mean average density (in dph)	**Standard deviation for the densities (in dph)**		**Standard deviation for the areas of the residential blocks (in hectares)**
3	1		2.27

5.3.3.4.2 DISCUSSION OF THE TYPE A4 HOUSING DENSITY DATA

The housing density calculations for the 4 type A4 test sites reflects that this housing type is comprised entirely of extremely low density housing, in the bottom part of the low density housing band. The density figures for all 4 sites are far less than 30 dph and the mean average for the 6 sites is 3 dph.

The standard deviation for the measurements is only 1 dph and this figure is very low. Type A14s very low standard deviation means that the densities of the type’s test sites are grouped very close together. This makes the mean average density figure more representative of the test site sample and means it is possible to say with more conviction that the type is a very ‘low-density housing type.‘

The only appropriate test sites that could be found and tested during the study for the A4 housing type were located in a single area on the periphery of Granada. The land in which the sites were located was originally owned by a single private landowner who ‘lotified’ the land and sold plots for residential development for high-income families. The landowner clearly ‘lotified’ the land in a fairly standardised way.

The mean average density and all 4 individual measurements for type A4 are extremely far below all of the optimum densities for the different ‘sustainability scenarios’ as given earlier on. This indicates how low the densities found here are in an international sense.

In terms of the numbers of people occupying type A4 dwellings, numbers are very often low in comparison with the figures for other housing types in the country. This is related to the fact that families occupying type A4 dwellings have high-incomes and family income in Nicaragua is roughly inversely proportional to the number of people occupying a family home. This is in spite of the fact that type A4 dwellings generally have large floor areas. To sum up, this means that the actual numbers of people living communities with large numbers of type A4 dwellings are actually perhaps even lower than the density in dph would suggest. With relatively low occupancy of large dwellings in the A4 type the dph figure required to enable the different ‘sustainability scenarios’ indicated by the optimum densities such as walking and public transport may actually be higher. As there are generally less occupants in type A4 dwellings than in dwellings belonging to other housing types greater dph densities are required to reach the threshold for numbers of people to make public transport and other urban functions viable. The only other housing type that type A4 is similar to in this sense is type A1.

The standard deviation in the area of the residential blocks used as the density test sites for housing type A4 is high in comparison to the other housing types. This indicates there is high variation in the area of the housing blocks. It is of course possible for the total area of different housing blocks to differ substantially while the densities of housing plots within them in doh remain quite close. This is because different blocks can contain different numbers of individual plots. In the case of the A4 test sites used here the numbers of plots in different blocks differed quite considerably though the size of each plot is similar and as a result density is fairly consistent.

5.3.3.5 TYPE A5

This housing type is modern (mostly built from approximately 1980 onwards) terraced housing, including areas of back-to-back housing, occupied by low and middle-income families and located in peripheral urban areas

5.3.3.5.1 DENSITY DATA (fig.5.43)

Location of residential block used as density test site	**Net residential density of density test site (in dwellings per hectare (dph))**	**Number of dwellings in density test site**	**Area of residential block used as density test site (in hectares)**
Barrio Pancasan, Matagalpa	30	9	0.3
La Villa’ 10 de Mayo, Masaya	42	15	0.35
La Villa’ 10 de Mayo, Masaya	43	15	0.35
La Villa’ 10 de Mayo, Masaya	44	15	0.34
‘La Villa’ 10 de Mayo, Masaya	46	16	0.35
Villa Bosco Monje, Masaya	46	16	0.35
Barrio Bergman Uriate, Matagalpa	52	24	0.46
Villa Sandino, Granada	54	18	0.34
Villa Bosco Monje, Masaya	57	20	0.35
Villa Sandino, Granada	60	22	0.37
Villa Sandino, Granada	64	30	0.47
Barrio 1 de Mayo, Matagalpa	65	17	0.26

Location of residential block used as density test site	Net residential density of density test site (in dwellings per hectare (dph))	Number of dwellings in density test site	Area of residential block used as density test site (in hectares)
Barrio 1 de Mayo, Matagalpa	65	23	0.35
Barrio 1 de Mayo, Matagalpa	69	31	0.45
Villa Bosco Monje, Masaya	70	23	0.33
Barrio 1 de Mayo, Matagalpa	71	20	0.28
Villa Bosco Monje, Masaya	74	18	0.24
Mean average density (in dph)	**Standard deviation for the densities (in dph)**		**Standard deviation for the areas of the residential blocks (in hectares)**
56	13		0.06

5.3.3.5.2 DISCUSSION OF THE TYPE A5 HOUSING DENSITY DATA

The mean average density for the housing type A5 is 56 dph which is medium density according to the density bands established earlier on. It is in the bottom half of the medium density band. In fact, all of the type A5 test sites have density readings which are above 30 dph and their density readings are dispersed throughout the band, though none are within 20dph of the upper limit of the band. All of the A5 sites are therefore classified as being of medium density.

The standard deviation for the type A5 density readings is 13 dph which is among the highest of all the housing types. Areas of housing of type A5 have been developed at different times over approximately the past 40 years and by different parties - from central government to local government to charities and cooperatives. It is therefore not surprising that the figure for standard deviation for the densities of type A5 test sites shows signs of the sites varying relatively widely from each other in terms of their densities.

The net residential densities of all except for 1 of the type A5 test sites meet the minimum density identified from literature as being required to enable the use of public transport as a means of mobility in a residential area. None of the test sites have densities which fit within the range of densities which sources within academia (Fulford, 1996) have identified as being optimum internationally for creating 'sustainable urban’ areas. None of the A5 test sites has a residential density high enough to be considered by Fulford (Fulford, 1996) to enable walking as a mobility option. None of the test sites have densities which meet the minimum density value established by Fulford in order to be characterised as a ‘central/accessible’ urban area.

The type A5 densities are among the highest of all the housing types. The fact that even these densities don’t meet so many of the measures of optimum density established in international academic literature is indicative of the fact that urban densities in the case study cities are low by international standards and when contemporary international norms for urban sustainability are considered.

The standard deviation in the area of the residential blocks used as the density test sites for housing type A5 is very low as compared to the other housing types. This indicates that there is comparatively low variation in the area of the housing blocks used as test sites for this housing type. Combined with the rather high standard deviation figure for the densities of the housing blocks used as test sites, this suggests that while the dimensions of housing blocks in this type do not vary as much as for other housing types, the densities and therefore the size of the plots within blocks vary more.

5.3.3.6 TYPE A6

This housing type is modern (mostly built from approximately 1980 onwards) areas of housing that have been master planned and built as a single project, comprising multi-storey dwelling structures, occupied by low-income families and located in central and peripheral areas.

TYPE A6 is split into 2 ‘sub-types,’ A6a and A6b. They are detailed below:

SUB-TYPE A6a: Areas of housing in which all units were planned and built as 2-storey structures, with each structure occupied by a single family

SUB-TYPE A6b: Areas of housing in which all units were planned and built as structures with 3 or more storeys, with each structure divided up into multiple single family dwelling units

The density data below is presented together with the discussion of the results for the 2 sub-types separately.

5.3.3.6.1 SUB-TYPE A6a (areas of housing in which all units were planned and built as 2-storey structures, with each structure occupied by a single family)

5.3.3.6.1.1 DENSITY DATA (fig.5.44)

Location of residential block used as density test site	**Net residential density of density test site (in dwellings per hectare (dph))**	**Number of dwellings in density test site**	**Area of residential block used as density test site (in hectares)**
FUNDECI, 2-storey, León	16	19	1.21
FUNDECI, 2-storey, León	16	16	1.02
FUNDECI, 2-storey, León	20	16	0.82
FUNDECI, 2-storey, León	21	14	0.67
Reparto San Antonio 2-storey, Managua (not a secondary city but used for reference)	39	16	0.41
Reparto San Antonio 2-storey, Managua (not a secondary city but used for reference)	43	12	0.28
Reparto San Antonio 2-storey, Managua (not a secondary city but used for reference)	43	16	0.37
Reparto San Antonio 2-storey, Managua (not a secondary city but used for reference)	46	12	0.26

Mean average density (in dph)	Standard deviation for the densities (in dph)		Standard deviation for the areas of the residential blocks (in hectares)
31	13		0.36

5.3.3.6.2 DISCUSSION OF THE SUB-TYPE A6A HOUSING DENSITY DATA

Only 2 areas of housing could be identified in urban Nicaragua in which all dwelling structures were planned and built as 2-storey structures, with each structure occupied by a single family. One of these was in a case study city - León - and is an area of detached single-family dwellings developed on the periphery of León by central government in the early 1980s. The area of housing is known as the FUNDECI development, based on the initials of the state development scheme which was responsible for its planning and construction. The other area was in Managua and is a development which is also made up of detached single family dwellings which were planned and built by central government in the early 1980s. The development was built in the existing neighbourhood or *reparto* of San Antonio which had been badly damaged by the Managua earthquake of 1972. Reparto San Antonio was included in the density measurements in this study because of the dearth of representative examples of this sub-type in the case study cities alone.

The mean average density for the housing sub-type A6a is 31 dph which is at the extreme lower end of the medium density band. As such it is just classified as medium density. However, it is notable that all 4 sites used to measure density within the FUNDECI development in León had densities of 21 dph and under and as such were in the low density band. All 4 sites used to measure density in

Reparto San Antonio in Managua had significantly higher densities than those in the FUNDECI development - all at 39 dph or over.

The standard deviation for sub-type A6a density readings is 13 dph which is among the highest of all the housing types. This relatively high figure is clearly representative of the variation in densities between the FUNDECI and Reparto San Antonio developments.

The net residential densities of all of the sites in Reparto San Antonio - but none of those in the FUNDECI development - meet the minimum density identified from literature as being required to enable the use of public transport as a means of mobility in a residential area. None of the FUNDECI or Reparto San Antonio test sites have densities which fit within the range of densities which sources within academia (Fulford, 1996) have identified as being optimum internationally for creating 'sustainable urban’ areas. None of the sites have a residential density high enough to be considered by Fulford (Fulford, 1996) to enable walking as a mobility option and none have densities which meet the minimum density value established by Fulford in order to be characterised as a ‘central/accessible’ urban area.

The fact that areas of housing planned and built as 2-storey dwelling structures have only achieved densities in the lower part of the medium density band and in the low density band is perhaps surprising. However, this is due to a number of factors. First of all, all of the dwelling structures are detached and occupied by a single family. In the FUNDECI and Reparto San Antonio developments there is a relatively large amount of space between neighbouring structures and between the structures and the access roads serving them. Each structure is situated on a relatively large plot providing private outside space on all 4 sides of each structure.

In addition, the width of access roads and the verges of the roads are often relatively large. These spaces are taken into account when calculating net residential densities.

The standard deviation in the area of the residential blocks used as the density test sites for housing sub-type A6a is neither particularly high or low as compared to the other housing types. This indicates that there is ‘medium’ variation in the area of the housing blocks used as test sites for this housing type. The area of the housing blocks are neither highly consistent nor wildly inconsistent. It is likely the case that there would be more consistency in the areas of the housing blocks within the same development, i.e. among the 4 FUNDECI sites or among the 4 Reparto San Antonio sites.

5.3.3.6.2 SUB-TYPE A6b (areas of housing in which all units were planned and built as structures with 3 or more storeys, with each structure divided up into multiple single family dwelling units)

5.3.3.6.2.1 DENSITY DATA (fig.5.45)

Location of residential block used as density test site	**Net residential density of density test site (in dwellings per hectare (dph))**	**Number of dwellings in density test site**	**Area of residential block used as density test site (in hectares)**
Los modulos de la cancha brigadista 4-storey, Matagalpa VERSION 1 (This site features a very large amount of unused land adjacent to the area occupied by the housing structures. This is because of poor design and this version of the calculation includes that land.)	53	16	0.30
Los modulos de la cancha brigadista 4-storey, Matagalpa VERSION 2 (in this version the area used in the calculation is adjusted so that the very large amount of unused land present in the site because of poor design is not included)	86	16	0.19
FUNDECI, 3-storey, León	109	36	0.33
Reparto San Antonio 4-storey, Managua (not a secondary city but used for reference)	159	64	0.4

Mean average density (using version 2 of the cancha brigadista calculation) (in dph)	Standard deviation for the densities (using version 2 of the cancha brigadista calculation) (in dph)		Standard deviation for the areas of the residential blocks (using version 2 of the cancha brigadista calculation) (in hectares)
118	37		0.11

5.3.3.6.2.2 DISCUSSION OF THE SUB-TYPE A6A HOUSING DENSITY DATA

3 areas of housing were identified in urban Nicaragua in which all units were planned and built as structures with 3 or more storeys, with each structure divided up into multiple single family dwelling units. Two of these are in case study cities - Matagalpa and León - and both were developed by central government in the early 1980s. The development in Matagalpa is in a central urban area and the development on León is on the urban periphery. The area of housing in Matagalpa is known as ‘los modules de la cancha brigadista’ <the brigade sports pitch modules/units>, referring to the adjacent sports pitch which was established by a military brigade. The area of housing in León is part of the FUNDECI development referred to in sub-type A6a. The 3rd area of housing is in Managua and is part of the Reparto San Antonio development referred to in sub-type A6a. As was explained in sub-type A6a, Reparto San Antonio was included in the density measurements in this study because of the dearth of representative examples of housing type A6 in the case study cities alone.

The mean average density for the housing sub-type A6a is 118 dph which is 23 dph greater than the lower limit of the high density band. As such it is classified as high density. However, it should be noted that the housing in the Matagalpa site demonstrates a density of 86 dph (or 53 dph if the large amount of unused land, vacant because of poor design, adjacent to the housing is included in the calculation) - thus being categorised as a medium density housing development. The densities of the housing in the sites in León and Managua both mean they are categorised as high density housing.

The standard deviation for sub-type A6b density readings is 37 dph which is very high in comparison to the figures for the other housing types. This very high figure is clearly representative of the high variation in densities between the Matagalpa, FUNDECI and Reparto San Antonio developments. This shows that among the few rare examples of housing planned and built on 3 or more storeys in Nicaragua, there has certainly not been a standard approach taken.

The net residential densities of all of the type A6b test sites meet the minimum density identified from literature as being required to enable the use of public transport as a means of mobility in a residential area. The FUNDECI and Reparto San Antonio test sites have densities which fit within the range of densities which sources within academia (Fulford, 1996) have identified as being optimum internationally for creating 'sustainable urban’ areas. The site in Matagalpa does not fit within this range of densities. Only the Reparto San Antonio test site has a residential density high enough to be considered by Fulford (Fulford, 1996) to enable walking as a mobility option, as is the case for meeting the minimum density value established by Fulford in order to be characterised as a ‘central/accessible’ urban area.

The standard deviation in the area of the residential blocks used as the density test sites for housing sub-type A6b is relatively low as compared to the other housing types. This indicates that there is ‘low’ variation in the area of the housing blocks used as test sites for this housing type. The area occupied by the housing blocks in the different type A6b test sites are relatively consistent.

Part 3: Findings 2, The challenges to residential densification

Chapter 6. Understanding the challenges to residential densification

6.1 Research participants' perceptions on urban sprawl, the ideas of the compact city and residential densification in the case study cities

The purpose of this section of the Delphi process was to explore the perceptions of the participants, all of whom are Nicaraguan urban development professionals, with a view to determining whether the views of urban development professionals in the case study cities constituted a challenge or an opportunity to instigating more compact patterns of urban development including residential densification.

6.1.1 What the Delphi participants were asked

In the 1st Delphi questionnaire participants were given a definition of urban sprawl and were asked if they believed that it was happening in the city in which they worked. If they believed that it was happening they were then asked whether they thought that it was having a net positive or negative impact on the city.

Regardless of the nature of their responses to the questions about urban sprawl, the participants were also given a factual and objective definition of compact city thinking and residential densification. They were then asked whether these ideas, if used in the city in which they worked, would have a net positive or negative impact on the city. This was all done in the 1st Delphi questionnaire.

6.1.2 The response

The data presented and discussed in this section was gathered as part of the Delphi process used in this study.

All of the Delphi participants were of the opinion that urban sprawl was occurring in the city in which they worked. They all considered sprawl to be a bad thing for the cities. They all also stated that urban sprawl in their city was a result of the inefficient use of land through development at low densities, including housing development. All participants had a basic understanding of the concept of development density and housing density.

All of the participants thought that the whole pattern of low-density, inefficient development of land for housing contributing to urban sprawl was bad for their cities. Neither of the Delphi questionnaires sought to gather data on why the participants thought that this was bad for their cities, rather the questionnaires were limited in this respect to determining whether the participants thought sprawl was happening or not, whether it was linked to the way in which housing was being developed and to density and whether or not the current situation was damaging.

All of the Delphi participants thought that, on balance, the principles of compact city thinking would be positive for the city in which they worked and would be an improvement on the current situation. Again, reasons for the positions adopted by the participants were not sought as part of the Delphi process. This was done during the 1st Delphi questionnaire.

As was explored in earlier chapters in this thesis, central to compact city thinking is the optimisation of urban housing densities. In these earlier chapters it was identified how such optimisation allows the efficient use of urban land and reduces low-density urban sprawl. On any given piece of land housing densities can be optimised by building new housing at higher densities if the land is vacant and if the land is already occupied using infill development, sub-division and other methods to densify what is already there. If we consider housing density by looking at the city as a whole, the process of residential densification to optimise the density of housing in the existing urban area - that is to say, the urban area that is already there, or the area that is already urban - includes both new house building on vacant plots within the boundaries of the city and the densification of areas already containing housing.

The concept of residential densification was introduced during the 1st round Delphi questionnaire and all of the participants understood what it meant and commented that it was important to use it in their city in order to work towards the principles of the compact city and to avoid future low-density urban sprawl. All participants were of the opinion that residential densification in the city in which they worked would be greatly beneficial to the city and would help avoid future low-density urban sprawl.

These findings suggest that the perceptions of the Nicaraguan urban development professionals taking part in the study about urban sprawl, the ideas of the compact city and residential densification as applied to the case study cities do not constitute a major challenge or barrier to residential densification taking place. In fact, the perceptions/views actually represent an opportunity to build momentum towards achieving residential densification based on support from the study participants.

6.2 Research participants’ perceptions on appropriate methods of residential densification for the case study cities

This section of the Delphi process aims to explore the perceptions of the participants, all of whom are Nicaraguan urban development professionals. It is hoped this will allow it to be determined whether the views of urban development professionals in the case study cities in this respect constitute a challenge or an opportunity to instigating more compact patterns of urban development including through residential densification.

6.2.1 Literature on methods of residential densification in developing countries

Based on the opinions each Delphi participant expressed regarding urban sprawl in their cities and the inefficient development of land at low densities including for housing, as well as about the ideas of the compact city and residential densification; the participants were asked about methods of residential densification.

In an earlier chapter in this thesis, existing literature was explored which identifies methods of residential densification in developing countries where low-density urban form predominates. It was noted that there is very little literature generally on the subject but that literature from South Africa dominates. The methods are presented in the literature as tools to be used as part of an approach to planning/construction of housing when seeking to work within existing towns or cities to realise a more compact urban form. As was noted, the methods of residential densification identified in the literature fall in to 3 categories. Methods achieving: higher density development ‘on greenfield sites ... within [a] ... city’s planned growth direction' (The City of Cape Town Spatial Planning and Urban Design Department, 2009); higher density development on 'vacant infill sites' within existing urban areas (p. 6); and densification lot by lot within existing urban areas, on lots which are already developed but where extensions/expansions can be made onto or next to existing structures or where subdivision of structures or lots can occur (p. 7). It was also noted that, in the latter case, densification can be used to expand living accommodation for a household that is already living on a plot or through subdivision create new living accommodation for an incoming household.

6.2.2 What the Delphi participants were asked

The Delphi participants were asked to describe in as much detail as they could the methods for residential densification that they saw as being appropriate in the case study cities in which they work. Before they did this the concept of residential densification was discussed with the participants in a factual and objective way but they were not introduced to the literature from South Africa which structures such methods into 3 categories. The participants were therefore more liberated to present their own opinions without being constrained consciously or sub-consciously by categories from literature. The data presented and discussed from here onwards in this section was gathered as part of the Delphi process used in this study.

6.2.3 Grouping the data

The discussion here of the data from the Delphi participants' is grouped into the 3 categories of methods of residential densification provided in the literature from South Africa referred to above. The Delphi participants go into more detail than that provided by the literature referred to above about the exact nature of the methods for residential densification that they saw as being appropriate in the case study cities in which they work. The methods the participants identified and described are set out below.

6.2.4 The response

6.2.4.1 Methods of residential densification category 1

Category 1, based on literature is ‘higher density development ‘on greenfield sites ... within [a] ... city’s planned growth direction’ (The City of Cape Town Spatial Planning and Urban Design Department, 2009)

The following appropriate methods were suggested by the participants which apply under category 1:

new house building at densities which make efficient use of land (10 out of 17 participants mentioned this method)

reduction in the average size of residential plots (13 out of 17 participants mentioned this method)

lotification of land to create plots whose edges meet those of neighbouring plots, i.e. no space between neighbouring plots (8 out of 17 participants mentioned this method)

building of residential structures which extend to meet one or more of the plot edges (4 out of 17 participants mentioned this method) the value of private outside space within residential plots was acknowledged but the extent of such space should be managed more strictly than at present - currently many residential plots possess extremely large amounts of private outside space, much of which is not used for any discernible function (14 out of 17 participants mentioned this method)

building of residential structures of more than a single storey (such structures could contain a single dwelling unit or multiple dwelling units) (14 out of 17 participants mentioned this method)

the width of roads providing access to the housing to be minimised - particularly considering that rates of car ownership in Nicaragua, on average (6 out of 17 participants mentioned this method)

the area given over to road verges to be minimised. They are often unnecessarily wide in the case study cities (4 out of 17 participants mentioned this method)

the critical importance of providing land for shared/public space and other community functions within areas of housing was acknowledged by the large majority of participants, however, the development of these uses should be treated more seriously than they currently are. In the case study cities, it is currently common for land within an area of housing which has been earmarked for such purposes to remain unused and vacant indefinitely after development of the dwellings. Residents often consider land in such a condition to be more of a problem than an asset because of security issues and because such areas serve as a habitat for dangerous animals and disease mosquitos carrying mosquitoes (7 out of 17 participants mentioned this method) development on sites that are as close as possible to the existing urban area and to existing key infrastructure such as roads, bus routes and water and electricity supply networks (5 out of 17 participants mentioned this method)

6.2.4.2 Methods of residential densification category 2

Category 2, based on literature is ‘higher density development on ‘vacant infill sites’ within existing urban areas (The City of Cape Town Spatial Planning and Urban Design Department, 2009)

The same methods suggested as being appropriate and listed under category 1 apply under category 2, plus the following:

prioritise vacant sites within the existing urban area before those outside it for housing development (5 out of 17 participants mentioned this method)

prioritise vacant brownfield sites within the existing urban area before greenfield sites in the existing urban area for housing development (6 out of 17 participants mentioned this method)

the value of devoting land within the existing urban area for shared/public space is acknowledged, however, it is also noted that the development of land for such purposes should be treated much more seriously than it currently is. If residential densification within existing urban areas is to occur then properly planned and resourced shared/public space will be crucial to making it a success. At present, there is a great deal of vacant space within the existing urban areas of the case study cities but a very small proportion of this provides any benefit to local residents. In fact, quite the opposite, security and dangerous animals on such uncared for sites is a problem (6 out of 17 participants mentioned this method)

6.2.4.3 Methods of residential densification category 3

Category 3, based on literature is ‘densification lot by lot within existing urban areas, on lots which are already developed’

The following appropriate methods were suggested by the participants which apply under category 3:

repair or renovation of existing residential properties in a poor state of repair to bring them up to an adequate standard for habitation. There are a large number of such properties in all of the case study cities and they are largely unoccupied, or if not under occupied based on the amount of land they occupy (9 out of 17 participants mentioned this method)

sub-division within existing large residential structures into a number of individual dwellings. There are a high number of large residential structures in a good state of repair in all of the case study cities which are extremely under occupied considering the amount of land they occupy. In addition, a large proportion of such properties are in central, very accessible parts of the cities (8 out of 17 participants mentioned this method)

extensions made to existing residential structures, including the addition of extra storeys (15 out of 17 participants mentioned this method)

conversion of existing non-residential structures into single or multiple dwellings (5 out of 17 participants mentioned this method) the sub-division of existing residential plots (2 out of 17 participants mentioned this method)

6.3 Research participants' technical understanding / knowledge on measuring housing density

The purpose of this section of the Delphi process was to explore the technical understanding / knowledge of the participants, all of whom are Nicaraguan urban development professionals, in a specific area. The aim was to determine whether the levels of understanding / knowledge of urban development professionals in the case study cities constituted a challenge or an opportunity to instigating more compact patterns of urban development including residential densification.

The data used here was collected mostly from the 1st Delphi questionnaire, with checking and extension done on the data during the 2nd questionnaire. Despite all of the participants having an effective general understanding of the concept of density, this section makes it clear that a major challenge to residential densification occurring in the case study cities is urban development professionals' incomplete knowledge on technical aspects of housing density, specifically how numeric measures of housing density are made. Knowledge differs across the set of participants - as is explored here - but the fact that any of these participants, who are urban professionals, have incomplete knowledge is a barrier to the evolution of responses to low density urban sprawl. Knowledge of numeric measures of housing density was specifically looked at as it serves as a barometer of the participants' technical knowledge on housing density – as opposed to their general understanding of the concept. Measures of housing density are, after all, the technical tool for quantifying the phenomenon.

6.3.1 Participants' level of understanding / knowledge on numeric measures of residential density

The table below in fig. 6.1 provides a summary of the level of understanding / knowledge about numeric residential density measures exhibited by the participants in their responses to the early questions in the 1st Delphi questionnaire. The analysis of the data involved the researcher making a judgement about each participant's level of knowledge based on an analysis of the Delphi round 1 transcripts.

Level of knowledge of participant on numeric measures of housing density	Number of participants exhibiting that level of knowledge	Information about the participants with that level of knowledge (occupation and city of work) *
A. No knowledge of numeric measures (though had basic understanding of the concept of housing density and wider connected issues)	6	Development control Granada, Development control León, Development control Masaya, Community development Masaya, Directorate Dep. Urban Planning/Development Matagalpa, International cooperation Matagalpa
B. No clear ideas of the numeric measures, but referred to literature in the interview and offered some suggestions based on that (+ had basic understanding of the concept of housing density and wider connected issues)	1	Policy planning León
C. Made some suggestions for numeric measures but confused by the array of different possibilities and was not able to be clear (+ had basic understanding of the concept of housing density and wider connected issues)	4	Policy planning Granada, Directorate Dep. Urban Planning/Development León, Historic conservation León, Project planning Masaya
D. Good knowledge, very certain and presented clear credible density measures (+ had basic understanding of the concept of housing density and wider connected issues)	6	Historic conservation Granada, Housing León, Policy planning Masaya, Directorate of Research Universidad Nacional de Ingeniería, Architecture teaching staff Universidad Nacional de Ingeniería (2 participants)

Fig.6.1. * City in which the participants work: Granada, León, Masaya, Matagalpa

The results from the table above are used in the sections below to discuss the participants' level of knowledge of numeric measures of housing density.

6.3.1.1 The relationship between the institution for which participants work and their level of knowledge about residential density

It is useful to consider from the table above whether it is possible to detect any relationships between the institution for which participants work (e.g. a local council in a particular case study city or a university) and their level of knowledge about numeric measures of residential density.

In terms of the institution in which participants work, there is an approximately even distribution of employees from local government in Granada, León and Masaya across the different bands (A, B, C, D) representing level of knowledge. In fact, there is one employee from each of these councils in each of the bands A, C and D. This accounts for the 3 employees interviewed from Granada's local authority, 3 of the 4 from León and the 3 interviewed from Masaya. This means that in each of those 3 cities there was: 1 person with no knowledge of numeric measures of housing/residential density, 1 who made some suggestions for numeric measures but was confused by the array of different possibilities and was not able to be clear and 1 who had good knowledge, was very certain and presented clear credible density measures. A total of 4 people were interviewed who worked in León as opposed to 3 in Granada and 3 in Masaya. The 'extra' person from León was in band B and as such had no clear ideas of the numeric measures, but referred to literature in the interview and offered some suggestions based on that.

Concerning Matagalpa council, a total of 2 employees who worked for the council participated and both were in band A as regards their knowledge of numeric measures of housing/residential density.

A total of 3 employees from the Universidad Nacional de Ingeniería in Managua (1 member of its Directorate of Research and 2 members of architecture teaching staff) participated and all 3 were placed in band D.

From these results it is possible to say that the participants from Matagalpa council showed relatively poor knowledge of numeric measures of housing density whereas the participants from the Universidad Nacional de Ingeniería in Managua showed relatively high knowledge. Broadly speaking, Granada, Masaya and León councils showed similarly even distribution of participants across bands A, C and D and as such their employees who participated demonstrated a wide range of knowledge on numeric measures of housing density.

6.3.1.2 The relationship between the area of planning/housing/urban development in which participants work and their level of knowledge about numeric measures of residential density

There are some noteworthy points that can be drawn from the results about the relationship between the area of planning/housing/urban development in which participants work (e.g. development control, policy planing, historic conservation etc) across the different cities and their level of knowledge about numeric measures of residential density.

First of all, all 3 of the participants who work in development control were placed in band A as regards their knowledge of measures of residential density.

The 3 people working in policy planning who participated were distributed across bands B, C and D with 1 person in each band. The policy planner working in León was in band B. The policy planner from Granada was in band C.

2 historic conservation officers took part and between them displayed relatively good knowledge of measures of residential density. The practitioner from León was placed in band C while the practitioner from Granada was placed in band D being extremely knowledgable and precise.

Rather unexpectedly, the 2 participants employed in senior positions in their respective cities' directorates for the Department of Urban Planning/Development, as a group did not excel in terms of their knowledge of numeric measures of housing/residential density. Both participants occupy senior managerial positions with responsibility for the whole department and both are charged with leading on urban development strategy. Both also come from educational and professional backgrounds in urban development. The participant from Matagalpa council was placed in band A while the participant from León was placed in band C.

3 participants occupy positions in the local governments of the secondary cities that do not correspond to any of the professional areas already mentioned. 1 participant works in community development in Masaya, 1 works in project planning also in Masaya and another works in housing in León. These 3 professionals are widely distributed in terms of their knowledge of measures of residential density. The person working in community development was placed in band A, the person working in project planning was placed in band C and the person responsible for housing was very knowledgeable and precise (band D).

As was noted in the previous section, the 3 academics from the Universidad Nacional de Ingeniería in Managua who took part displayed outstanding knowledge and were very clear and assured in their responses (all band D).

6.3.1.3 Participants' confusion when attempting to describe the numeric measures for housing/residential density

After being asked to describe the ways in which residential density can be measured only 6 of the 17 participants in this study were placed in band D, showing 'good knowledge, [being] very certain and present[ing] clear credible density measures.' The 11 other participants were in some way uncertain or unclear (they were in bands A, B or C). This section outlines the ways in which the suggestions given by the 11 participants placed in bands A, B and C were lacking and therefore starts to elucidate the specific nature of this barrier to residential densification.

First of all, perhaps the most fundamental error of understanding which was evident and displayed by a large proportion of the 11 participants was a failure to appreciate the difference between 'measures of people density' (described in (Cheng, 2009)) from measures of the level of occupation of dwellings. For example, measures of people density consist of measures like the number of dwellings per hectare or the number of people per manzana (a Latin American measure of land area) whereas measuring the level of occupation of dwellings involves calculating for example, the actual or average number of inhabitants living in a dwelling. The concept of density was explored earlier on in this thesis. Roberts and Greed (Roberts and Greed, 2001) consider that only measures of people density truly describe the density of urban development found in an area. In contrast, measuring the level of occupation of dwellings is not a record of the density of housing but is a measure of the extent of overcrowding or otherwise within dwellings.

For instance, a participant who works as a historic conservation officer in León suggested that an appropriate measurement of housing/residential density would be to calculate the "quantity of human population in a defined area," for example, "in a single neighbourhood." However, when they attempted to describe how this would be done they proposed dividing the number of people in the neighbourhood by the number of dwellings in the neighbourhood, reaching a value for the number of people living in each dwelling. This example clearly shows how a participant fundamentally failed to appreciate the difference between measures of people density and measures of the level of human occupation of dwellings.

Secondly, an area of misunderstanding which is perhaps not so fundamental but is nevertheless problematic and was displayed by a large proportion of the 11 participants in bands A, B and C is a deep confusion over deciding which units are most appropriate for measuring housing/residential density. It is of course possible to debate whether the 'amount of housing' existing in a given area should be measured, for example in terms of numbers of residents or numbers of dwellings. However, on the whole the 11 participants in bands A, B and C failed to articulate clearly what the implications would be for employing different units of measurement and often seemed to vaguely assume that using any unit would perform exactly the same function as using any other. Many of the participants were rather indisciplined and imprecise in the way that they changed from one unit for measuring the ‘amount of housing’ to another while explaining how they thought density should be measured in any single given scenario.

For example, 1 participant employed in a senior position in León’s directorate for the Department of Urban Planning/Development when discussing measuring residential density in a particular real-life scenario spoke of a quantity of 6 dwellings and 6 people per dwelling as if they amounted to the same thing.

The 11 participants in bands A, B and C also repeatedly seemed confused over which were the most appropriate units for representing the area of a site for which a measurement of residential density was sought. For example, the same participant mentioned in the last paragraph employed in a senior position in León’s directorate for the Department of Urban Planning/Development spoke of representing the area of a site in metres squared, manzanas and hectares as if the resultant numerical figure for density would stay the same if any of the units were used.

Finally, two particularly serious misunderstandings related to how residential density can be measured were displayed by a small number of the 11 participants in band A, B and C. 1 participant employed in a senior position in Matagalpa’s directorate for the Department of Urban Planning/Development expressed his central argument that a value for residential density can simply be reached by measuring the size of the plots of land on which dwellings in the area being studied are built. When asked to define residential density the participant proceeded to explain that the Normas Técnicas Obligatorias Nicaragüenses <Nicaraguan National Obligatory Standards> (established nationally but implemented locally) did this by establishing a minimum residential plot size of 8 metres by 16 metres. Not only does the figure he provided conflict with the national minimum plot size provided by other participants (there is clearly much confusion over the specifics of these national guidelines) but by equating residential density with plot size he is clearly mistaken.

1 participant, employed as a development control officer in Granada seemed mistaken by another aspect of how residential density can be measured. He expressed a belief that in any given scenario the appropriateness of the various options for measuring residential density depends upon the income level of the families populating the area of housing being studied. Without ever actually specifying in detail how different measures of residential density operate, the participant stated clearly that absolutely different measures should be used for "repartos populosos" <'populated' or working class neighbourhoods> and "zonas residenciales" <'residential' or high-income zones>. While it is true that different types of housing may present different challenges as regards measuring residential density and that different methods may be more productive in these different scenarios the author has not been able to detect in reliable academic or policy literature any suggestion that the income levels of residents dictates which measure of residential density should be used.

6.3.2 Exploring participants' suggestions for which numeric measures should be used for housing/residential density

Participants' suggestions for how housing/residential density should be numerically measured were collected in the Delphi round 1 questionnaire. They are presented in the table in fig.6.2 below along with a breakdown of what 'knowledge band' from earlier the participants suggesting different measures belong to. The measures were all suggested by at least 1 of the participants without suggestions on the nature of what measures should be being given by the researcher.

Suggestion for numeric measure of residential density	**Number of 'band A' participants suggesting the measure**	**Number of 'band B' participants suggesting the measure**	**Number of 'band C' participants suggesting the measure**	**Number of 'band D' participants suggesting the measure**	**Total number of participants suggesting the measure**
Inhabitants per manzana		1		2	3
Inhabitants per hectare		1	1	1	3
Inhabitants per barrio		1			1
Inhabitants per square metre	1		1		2
Families per manzana				1	1
Dwellings per manzana	1			3	4
Dwellings per hectare	1			5	6
Size of plot	1				1
Proportion of plot occupied by housing structure(s)	1				1
Inhabitants per dwelling		1	2		3
Total number of suggestions	5	4	4	12	25

Fig.6.2. For reference, the number of participants in each 'knowledge band' are as follows: band A (6), band B (1), band C (4), band D (6).

6.3.2.1 A note on the interpretation of the participants' suggestions for numeric measures of housing density

First of all, it is important to stress that the author did not give any information regarding possible ways of measuring housing/residential density to participants during the completion of the Delphi 1 questionnaire. In addition, no such information was given in any of the written documents provided by the author to the participants prior to completion of the Delphi round 1 questionnaire. Consequently, any suggestions for ways of measuring residential density given by participants in the 1st round questionnaire are purely their own ideas, uninfluenced by the author.

Secondly, it should be made clear that the knowledge displayed by band D participants regarding numeric measures was so much more complete, assured and precise than the knowledge evident from band A, B or C participants. As a result, in the discussion of these results a suggestions made by an individual band D participant is generally taken as having greater merit than a suggestion made by an individual band A, B or C participant.

Band D participants are distinguished in this way from all other participants as the gulf is so great between their very comprehensive, assured and precise knowledge on the numeric measures and the level of knowledge on numeric measures exhibited by the other participants. The difference between participants between bands A, B and C is the extent of misunderstanding, confusion and lack of clarity which they displayed.

6.3.2.2 Discussion of the data on participants' suggestions for which numeric measures should be used for residential density

6.3.2.2.1 NUMBER OF SUGGESTIONS MADE BY PARTICIPANTS IN BANDS A, B, C AND D

That there were 17 participants and 25 suggestions in total for numeric measures which could be used for residential density obviously means that on average each participant made more than 1 suggestion, although in reality some participants made 2 or more suggestions and some participants did not make a single recognisable suggestion.

The 6 band A participants made 5 suggestions for measures between them. The single band B participant made 4 suggestions and the 4 band C participants made 4 suggestions. The 6 band D participants made 12 suggestions.

It is interesting that despite bands A and D both having 6 participants, band D participants made more than double the number of suggestions for measures that could be used than band A participants. From the author's experience conducting the questionnaires this is because band A participants were greatly more aware of the different viable options for numeric measures for residential density and were far more assured in putting across their suggestions in a clear manner.

The single band B participant made 4 suggestions for measures for residential density and in the experience of the author this reflected the fact that she had consulted literature during her completion of the Delphi 1 questionnaire. The 4 band C participants made only 4 suggestions between them and in the view of the author this is symptomatic of their confusion regarding the different options available for measuring density.

6.3.2.2.2 The nature of the suggestions made by the participants

The suggestions made by the participants for numeric measures that could be used for residential density can fundamentally be put into 2 groups. The first 7 measures in the table above are ‘measures of people density,’ as described by Cheng (2009) and referred to in the chapter introducing the concept of density. They include both measures of the ‘people per defined area’ type and the ‘dwellings per defined area type.’ The final 3 measures in the table describe the internal dynamics of individual plots, either the size of a plot, the proportion of a plot occupied by housing structure(s), or the number of inhabitants per dwelling.

25 individual verbal suggestions for numeric measures were given by the participants to the researcher in total during the completion of the 1st Delphi round. Some of these were for the same measure as others and would constitute the same one of the 10 ‘measures’ described in the previous paragraph. Of the 25, 20 were suggestions for ‘measures of people density’ and only 5 were suggestions for measures which describe the internal dynamics of a plot. In addition, 12 of the verbal suggestions for ‘measures of people density‘ were from band D participants and 8 were from band A, B or C participants. None of the suggestions for measures which describe the internal dynamics of a plot were from band D participants and of the 5 suggestions for this type of measurement 2 came from

band A participants, 1 came from the band B participant and 2 came from band C participants.

The data makes it clear that overall the participants overwhelmingly favour 'measures of people density' as opposed to measures which describe the internal dynamics of a plot as a way of determining residential density. Furthermore, the band D participants, whose knowledge on these matters is the most comprehensive of all the participants, exclusively suggested that 'measures of people density' be used.

The 7 'measures of people density' that arose from the exercise, can be further subdivided into measures of 'people per defined area' and measures of 'dwellings per defined area.' The distribution of the suggestions within these 2 'sub-groups' is interesting. There were 10 verbal suggestions from participants for each of the 2 'sub-groups.' However, there were only 4 suggestions from band D participants for measures of 'people per defined area' while there are 8 verbal suggestions from band D participants for measures of 'dwellings per defined area.' This means that the far more knowledgeable band D participants overwhelmingly favour the second sub-group of measures as a way of determining residential density.

2 measures were suggested by participants which are categorised in the 'dwellings per defined area' sub-group. These were the measures of 'the number of dwellings per manzana' and 'the number of dwellings per hectare.' The first measure was verbally suggested 4 times in total, which included 3 suggestions from band D participants, while the second measure was suggested 6 times in total, including 5 suggestions from band D participants. As a result, of the 2 measures, 'number of dwellings per hectare' can be judged to be most favoured format, not only among

all those participants who suggested a ‘dwellings per defined area’ measure but also among the band D participants who did so.

6.3.3 Participants’ judgements expressed in the 2nd round Delphi questionnaire about which of all the measures recorded in the 1st Delphi round were most suitable as a standard measure of residential density for Nicaraguan secondary cities

Prior to the 2nd round Delphi questionnaire, the results of the 1st round were fed back in an aggregated form to all participants. This followed the Delphi principles of feeding back the findings from one stage of enquiry into the next stage and at each stage aggregating the responses from each individual expert to form a group response (Rowe and Wright 1999 cited in Garrod and Fyall 2005).

The feedback included a list of all the numeric measures suggested for housing/residential density that had been given during the Delphi round 1 questionnaire. The order of the list was the same as in results table discussed in this section. In the list the measures are ordered according to categories of measure. First of all, measures in the category of inhabitants/families per defined area are given. This is followed by the measures in the following categories respectively: number of dwellings per defined area, measures of the internal conditions in a plot (i.e. the size of plot, proportion of plot occupied by housing structure(s) or the number of inhabitants per dwelling). It is the opinion of the author that this is a logical and clear approach to ordering the list of measures for residential density and one that does not seek to influence the participants’ decision making regarding the measures in the Delphi 2nd round questionnaire.

In the 1st question of the Delphi round 2 questionnaire, the participants were asked to rate the measures in the list in order to express which one(s) they favoured to serve as a standard measure of residential density for Nicaraguan secondary cities. This approach was guided by Delphi principles which encourage the iterative development and refinement of research data through the use of more than 1 data collection stage which are linked by feedback of data between the stages. The results of this are displayed in the table below with a discussion which seeks to interpret what they mean.

The 1st question of the Delphi round 2 questionnaire asked all participants to provide their top 3 preferred measures to act as the standard measurement. The participants were required to distinguish between the top 3 as 1st, 2nd and 3rd most appropriate measurements. The Delphi round 1 questionnaire was completed in January and February 2010 and the round 2 questionnaire was completed in January and February 2011.

The results of the participants' rating of the measures for residential density are given in the table in fig.6.3 below.

Suggestion for numeric measure of residential density	Number of participants selecting this measure as 1st most appropriate	Number of participants selecting this measure as 2nd most appropriate	Number of participants selecting this measure as 3rd most appropriate
Inhabitants per manzana		1	3
Inhabitants per hectare	1	2	10
Inhabitants per barrio			
Inhabitants per square metre			
Families per manzana			1
Dwellings per manzana	3	10	1
Dwellings per hectare	12	3	2
Size of plot			
Proportion of plot occupied by housing structure(s)	1		
Inhabitants per dwelling		1	

Fig.6.3.

The data in the table above clearly shows that the measure ‘dwellings per hectare’ was the most popular 1st choice as well as having the greatest number of total tallies of 1st, 2nd and 3rd choice. No other measures rival it for choice of 1st most appropriate measure but 2 other measures come close in terms of the total tallies of 1st, 2nd and 3rd choice.

6.4 Research participants' experience and perceptions of the challenges to residential densification in the case study cities

This data presented and discussed in this section was gathered as part of the Delphi process used in this study. This section uses input from the participants to identify and discuss the challenges to residential densification occuring in the case study cities. Each participant spoke about the city in which they worked but the data is combined to identify themes that cut across the different cities.

6.4.1 Theme 1: The culture of low housing density in Nicaragua and the case study cities

6.4.1.1 The persistence of 'rural housing density practices' in Nicaraguan urban communities and the enduring expectation of a low-density lifestyle

Briggs and Yeboah (Briggs and Yeboah, 2001) describe the phenomenon of families in African cities, having migrated from rural to urban areas, who continue to live 'a rural lifestyle in the city.' In the work, specific countries or cities are not referred to directly but the thrust of the argument is that this is a phenomenon seen in many urban communities across the continent. Briggs and Yeboah describe how lifestyle customs and expectations that people have brought with them from the countryside influence the way in which areas of housing form in the cities. This can involve housing built by families themselves under formal processes - or more often informally - or could involve housing built as part of public or private formal development schemes. Such development schemes may be influenced by social, financial and political frameworks/structures whose character is primarily ‘rural’ - part of a wider societal view of the world still heavily influenced by agriculture and the countryside.

A central feature of the urban communities described by Briggs and Yeboah which make them seem rural or at least partially rural in character is the low housing density exhibited consistently across the communities. The families in question live on large residential plots, they exclusively occupy low-rise structures and they use much of the significant amounts of outside space they have within the plots to keep animals and grow food.

As way of an illustration, fig.6.4 shows a satellite image of part of a neighbourhood within the urban area of the city of Kinshasa in the Democratic Republic of Congo (DR Congo) which has been developed by a mixture of formal and informal means. The way in which those establishing the plots have ‘satisf[ied] a need to stake out a space‘ (Briggs and Yeboah 2001, p.22) is visible, using rustic markings and lines of small trees and bushes. The plots on which the dwellings are built are clearly significant in size and very much more expansive than the dwelling structures themselves. In addition, the ‘staking out’ has clearly not been done with much sense of wanting to maximise the use of space, with significant space between plot boundaries and roadways leaving relatively large amounts of vacant space. This is an established neighbourhood in terms of the length of time it has existed and densities at this stage are low, having not been optimised either during original development or by later infill development. The city has grown outwards far in advance of this neighbourhood without infill development raising densities here and the city continues to grow outwards.

Fig.6.4. Satellite image of a residential area bordering the Avenue Révolution in the Quartier Sakombi neighbourhood in southern Kinshasa, DR Congo (Google, 2013).

It is vital to acknowledge the critical ‘safety net’ given to families by occupying residential plots, which provide capacity to engage in subsistence agricultural activity. This can play a meaningful role in ensuring the wellbeing of the families concerned. Urban to rural migrants often find themselves in particularly vulnerable situations in terms of stability of income and because they can no longer depend on the strong familial/community networks which they may have had in their rural place of origin. However, of interest for the purpose of this study is the enduring effect that the persistence of rural ‘housing density practices’ has on the psyche of the people and on what they consider to be acceptable and desirable urban housing.

In terms of the effect on the overall sustainability of the cities concerned of what I will term the ‘rural housing density practices’ described by Briggs and Yeboah, they observed that a direct result in African cities was the preponderance of low-density urban sprawl, something that their writing infers is wasteful in terms of use of space. In fact, Africa has the lowest average urban housing densities - and the greatest incidence of low-density urban sprawl - in the developing world. These problems when encountered in developing countries can be particularly damaging because such a large proportion of the population do not have the resources to overcome spatial barriers to employment and services etc.

Based on data from the Delphi process, but also from the following sources: the housing density data collected as part of this study; the author’s study of Nicaraguan policy documents, plans and legislation; and the author’s own observations, the ‘rural housing density practices’ identified by Briggs and Yeboah in African cities, are also evident in the Nicaraguan case study cities. In many areas of all 4 case study cities all of the main components of the picture in African cities are present, namely: the low housing density exhibited consistently across the urban communities, the large residential plots, the presence of only single storey structures and the large amounts of private outside space within residential plots within which families often keep animals and grow food.

Based on observation data, the cities of Granada and Matagalpa demonstrate the greatest levels of current or very recent informal housing development of the four case study cities. In both cities, this housing exhibits low densities and is close to the characterisation of 'rural style housing' given above. In Granada these characteristics are more extreme than in Matagalpa. In both cities such housing occupies peripheral locations. In Granada these areas of housing are located on the southern and eastern peripheries of the city. In Matagalpa they are located on the northern and southern peripheries.

Masaya and Leòn do not demonstrate as high levels of current or recent informal housing development but recent developments involving intervention from local government or international cooperation exhibit 'rural housing density practices' including low densities. The greatest example of this in either city, both in terms of area of land occupied and level of political intervention is the Leòn South East urban extension.

Figs. 6.5 and 6.6 show different parts of the León South East urban extension zone. In both the satellite image and the ground level photograph the physical manifestations of ‘rural housing density practices‘ such as low densities, large plots and seemingly little concern for maximising the efficiency of land use. It is interesting to note that the masterplan for the León South East urban extension zone, including the detailed layout of plots and their dimensions were devised by the León local government. A network of paved and unpaved roads and limited infrastructure was planned and serves the extension area, the cost of which has been paid for by the public sector in partnership with international cooperation organisations. In the light of this significant cost it is indeed curious that not more effort has been made at an institutional level to introduce more efficient plot dimensions and layout planning. In this case, a structural bias in government in favour of ‘rural housing density practices‘ is detected reflecting the current state of Nicaraguan society’s wider values and preferences.

Fig.6.5. Satellite image of a block located 5 blocks south of the main highway running through the León South East extension zone. Developed within the last 10 years (Google 2013).

Fig.6.6. Photograph of part of a single housing plot within a block in the León South East urban extension area, located 4 blocks south of the highway running through the middle of the extension zone (Morton 2011).

In terms of residential areas that have been established for a significant amount of time, i.e. areas of colonial style housing or areas of housing established in the 1980s Matagalpa has the highest average densities, clearly influenced in a large part, according to the Delphi participants from that city, to the city's location in a mountain valley with substantial space for expansion only found “up or down the valley” (2 Delphi participants from Matagalpa) to the north or south.

In terms of established housing Granada has some of the most extreme examples of low densities in some of its colonial style housing in central urban areas, where plot sizes are very large and there has not been significant subdivision of structures. One of the Delphi participants from Granada described the city as being in danger of “being hollowed out” as areas of colonial housing occupied by high-income residents in central urban areas, which have always had low densities in dwellings per hectare but which in the past were home to large extended families, are now losing their population. In this city, Nicaragua’s “capital of tourism” (a Delphi participant from Granada), many properties are being sold by Nicaraguan families to foreigners living as single people or couples or are now occupied by only a few members of Nicaraguan extended families which have seen many of their members move abroad.

Delphi participants from all 4 cities described a picture of housing development in the case study cities heavily influenced by ‘rural thinking’ that closely mirrors what Briggs and Yeboah observed in African cities. Individual families as well as social, financial and political structures in the case study cities and nationwide develop housing in a way that is heavily influenced by ‘rural thinking’ as part of a wider societal view of the world still deeply shaped by agriculture and the countryside.

A Delphi participant from Masaya was particularly specific in describing his difficulties working within local government because of the rural ways of thinking that dominated approaches towards planning and housing. For example, the participant identified how they had worked to build the groundwork for urban containment in planning policy for the city of Masaya with a view towards ultimately setting a limit to urban extension surrounding the city - a greenbelt in other words. This participant had also pushed to include content on infill development and minimum densities in policy for the city. The participant said that these ideas were based on planning principles that they had studied at university and had read about but reported that the ideas were alien to the municipal polity and were not seriously received, were not supported and were not included in policy or adopted in any strategic way.

Delphi participants from all 4 cities noted that many families in their cities live what they considered to be a rural or partially rural lifestyle, in terms of their living structures and space, the amount of private outside space they had, their level of reliance on subsistence agriculture; and their relationship with neighbours - participants referred to the significant freedoms residents enjoyed, for example, to play their TV or stereo at high volume or to cook using a barbecue producing lots of smoke because they had considerable space separating them from their neighbours.

Just as the important role subsistence agricultural capacity plays in African cities, as noted by Briggs and Yeboah, is acknowledged its similar role in the Nicaraguan case study cities is recognised as being beyond doubt. Delphi participants appreciated that ‘living the rural life in the city’ could be useful for families, particularly because it gave them capacity for subsistence agriculture. However, the participants were also clear that low ‘rural housing densities’ in the case study cities contribute very directly and very significantly to average densities in the case study cities being very low and to the worrying levels of uncontrolled low-density urban sprawl in the cities. The participants were clear that as urban development professionals they strongly favoured more compact models of urban development with higher housing densities than the status quo. In addition, a significant minority of the participants observed that the fact that families were using urban private outside space for subsistence agriculture represented a huge failure of Nicaraguan secondary cities to supply their residents with adequate opportunities for employment and income generation.

The Delphi participants noted that the ‘rural character’ of much of urban life was highly ingrained in many parts of Nicaraguan secondary cities. They explained how these patterns experienced across Nicaragua were manifest in all 4 of the case study cities. One of the major points which emerged was that precisely because ‘low density life’ had become so ingrained in many parts of the case study cities and across Nicaragua this formed a major cultural barrier to the implementation of more compact urban development strategies.

The participants were able to provide an intriguing insight into the principal physical and spatial components of Nicaragua’s ‘rural-urban places.’ That they were able to provide such a lucid picture was testament to the way in which their input drew from their experience as urban professionals but also as Nicaraguans.

6.4.1.2 The dominance of single-storey housing structures in the case study cities and urban areas across Nicaragua

The Delphi participants painted a similar picture to that described by Briggs and Yeboah of historic and current patterns of rural to urban migration creating urban residents and urban structures and institutions which were very influenced by rural thinking. However, something that also emerged very strongly was the extreme psychological and cultural impact across Nicaraguan society, particularly urban society, of the horrifically destructive Managua earthquake in 1972 where much of the worst destruction and loss of life was caused to multi-storey buildings. Although, the physical effects were felt primarily in Managua, tens of thousands of people who survived but were made homeless by the earthquake moved as refugees to other Nicaraguan cities, including all 4 of the case study cities. These people took their first hand experience of the earthquake to other cities and, according to the Delphi participants, brought a fear of living in multi-storey buildings caused by the destruction they had experienced. Nicaragua, with a relatively small population - and smaller still in 1972 - whose population distribution is heavily concentrated in the western third of the country was left shocked to its core by the earthquake and the widespread failure of multi-storey buildings.

The participants explained that pre-earthquake Managua had had a compact physical layout of, incorporating multi-storey residential structures producing a high density urban fabric. They recalled - some of them literally ‘recalling’ from first hand observation - how, in Managua the low density character of the current city had developed since 1972, mainly out of fear that buildings on any more than a single storey were at risk of collapsing in the event of future earthquakes. Many of the

Delphi participants took a conceptual step from there to suggest that, post 1972, Nicaragua, with a relatively small population had become quickly enthralled to the idea that single storey residential structures were the only safe way to live, in urban as well as rural areas. The participants noted that in the case study cities, in common with the rest of the country this association of single-storey housing structures with safety for the family was a major barrier to residential densification, as densification would require at least some building of homes on more than a single storey. The fact that perceived personal and familial safety is a major component in this matter means that incredibly powerful emotive forces are at work and means the barrier to change is very great.

An observation of this study is that Nicaraguan society certainly has major difficulties in accepting living spaces built using more than single storey and this plays a major cultural barrier to residential densification. A Delphi participant from Masaya described these difficulties as effectively presenting an “unofficial moratorium” across the country on domestic structures of more than a single storey. According to the participant:

> Some neighbourhoods were built in the north east of Masaya in the 1970s after the earthquake in the capital [city]. They were built to receive people seeking refuge from the destruction in Managua caused by the earthquake. All of them were single storey structures and from what I’ve heard that was very important for the people moving and for the city [Masaya], you know make them [the people moving] feel safe after everything they had known, taller buildings, had fallen down and killed lots of people. Masaya is the

> closest city to Managua and I can see, from my opinion, I mean, that it may have been the city that was most effected by Managua's earthquake.

The author observed a number of 2-storey dwelling structures in Nicaraguan cities, especially in Matagalpa, but these were certainly hugely in the minority when compared to the numbers of single storey structures. Domestic buildings of more than 2 storeys are extremely rare in Nicaragua.

Specifically concerning Matagalpa, a participant from the city suggested that of the case study cities it has an urban form most characterised by buildings on more than a single storey. When discussing the subject of earthquakes he also suggested that its urban form is less affected than the other case study cities by earthquakes and fear of earthquakes, though this concerned people's view of the effect of earthquakes on Matagalpa rather than specifically the legacy of the 1972 Managua earthquake. The participant confirmed information known to the author that Matagalpa is far less prone to seismic activity than the other case study cities because of its geographical location.

A small number of Delphi participants went further than rural influence and the 1972 Managua earthquake to offer a more detailed historical context to explain the Nicaraguan preference for single storey accommodation. They talked about the psychological impact of the 1972 earthquake bringing about renewed fondness for the single storey historic colonial style properties arranged around courtyards, the best examples of which were found in the cities of Granada and León and which had existed before the development of Managua as a city. This was a model, which had never really been used in Managua which was developed as a city much later than Granada and León.

The single storey historic colonial style properties with courtyards described here by the Delphi participants are best represented by the housing type ‘A1 (historic colonial style housing located in the central urban area with no significant subdivision)’ identified as part of the housing typology for Nicaraguan secondary cities established earlier on in this thesis using the 4 case study cities. Fig. 6.7. shows one of the sketch up images created to help define the housing type A1, while fig. 6.8. is a photograph of the facade of a residential block in Granada which exemplifies this housing type. The large courtyards giving very ample patio space are visible in fig. 6.7. and the single storey form are apparent in both figs. 6.7 and 6.8. The density of this housing type is very low - having an average net residential density (calculated from the density readings done as part of this study) of 15 dwellings per hectare, with the block in figs. 6.7 and 6.8 having a net residential density of 6 dwellings per hectare.

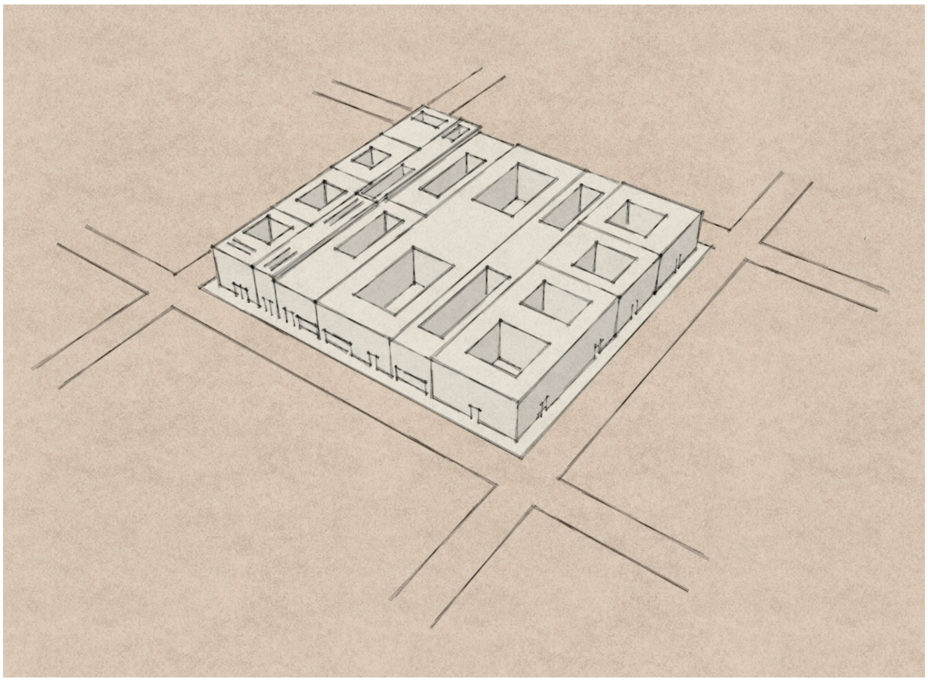


Fig.6.7. Sketch up image created to help define the housing type ‘historic colonial style - without significant subdivision’ (Sketchup diagram, Morton 2011)

Fig. 6.8. Photograph of a residential block in central Granada used as one of the density test sites for the housing type A1. All of what is visible in the photograph is a single dwelling, housing one high-income family (photograph, Morton 2010).

6.4.1.3 The patio - private outside space to live and to operate: but how much space is necessary?

Related to the factors mentioned above, which combine to make residential densification more difficult in the case study cities - namely the effect of ruralism on housing practices in urban areas in Nicaragua and the enduring repercussions of the 1972 Managua earthquake - another related factor is at play. This is the cherished role of 'the patio' at all levels of Nicaraguan society.

The Delphi participants revealed much about this widespread feature of Nicaraguan domesticity. They gave a fascinating insight into its central domestic importance, talking both as urban development professionals and as Nicaraguans. The patio is the term used in Nicaragua to describe the private outside space within a residential plot. Patios can consist of space bounded by residential structures, such as that found in the courtyards of historic colonial style properties, or partially bounded by residential structures or can be space between residential structures and the outer edge of the plot. The participants explained that the patio is thought of within Nicaraguan society as an outside space that should be private (for the exclusive use - and access - of the family) and should provide a multi-purpose space for household chores, leisure and possibly income generating activities. The strength of association in Nicaragua between the idea of the home and the patio should not be underestimated.

Information from the Delphi participants, as well as the density data collected as part of this study and the author's own observations, showed a wide distribution of patios across all 4 of the case study cities.

A Delphi participant from León described how the patio features in people's housing expectations in the León South East urban expansion area.

> *Talking about 'the Poetas' neighbourhoods [the collective name for the neighbourhoods making up the urban expansion area], people want their space, not only for their housing structure but also for their 'patio' [a Nicaraguan term for domestic outside space] so they can do their washing and cooking and other things ... I think since the Managua earthquake [in 1972], within Nicaraguan society the people have got accustomed to have their own piece of space, which they can own and say "this is mine."*

In the quote above concerning the León South East expansion area, the 1972 earthquake in Managua is mentioned. As was noted previously in the theme 1 section, the influence of the 1972 Managua earthquake in people's views on housing throughout Nicaragua is longstanding. The quotation again demonstrates that the 1972 earthquake had a deep and enduring effect on views within Nicaraguan society on what constitutes appropriate urban form.

Participants recognised that the concept of the patio was almost certainly rooted in the idea of the courtyard from historic colonial style properties but that it had also been added to by the fact that rural to urban migrants had brought with them to cities an expectation of having private outside space. The widespread practice in the development of Nicaraguan cities of setting up informal dwellings had also meant that migrants had had the ability to provide themselves with outside space. It is easy to see how the preference for single storey dwelling structures which had emerged after the 1972 Managua earthquake became allied developmentally with a practice for having large domestic plots, capable of providing a significant patio. Some Delphi participants suggested that this gave the patio a ‘new lease of life’ in terms of the frequency of its use and its distribution in areas of Nicaraguan housing developed after 1972. This was true of housing developed formally and informally.

The Delphi participants often spoke about residents’ right to be able to conduct their household duties such as cooking and washing clothes with dignity and in privacy and the fact that the relatively large amounts of private outside space found within the plots of low-density neighbourhoods allowed them to do that. However, the Delphi participants also recognised that residents quite often took the assertion of their rights to unreasonable extremes. Participants highlighted how residents 'taking things to extremes' formed a barrier to higher density living, sharing space in urban areas and ultimately the country’s ability to address problematic uncontrolled urban sprawl.

A Delphi participant from León described the characteristics of a dwelling located approximately half a kilometre from León's central park and cathedral. The quote shows in quite an illuminating way that it is reasonably common for significant amounts of 'patio' space within historic colonial style city blocks in central urban areas of León to be relatively underused/inefficiently used. The dwelling is one that the participant knows well through their work and is one they consider to be useful as being representative of an extremely common dwelling type in the city of León. The description was as follows:

> *The house is old, well it is in one of the original colonial housing blocks in the city. These dwellings are now occupied by families who are not rich, but I suppose also not the poorest. The block is so large that there is a very large area of land in the interior of the block that you cannot see from the street. Actually a lot of that land, well, the residents don't do anything with the land, but some of it they dedicate it to the cultivation of things to eat and for keeping animals like a pig, you know. In some blocks like that there are a few banana trees or mango trees. In a lot of the dwellings, the number, or better said, the area of housing structures is not so great and the people are living in one corner of the whole plot.*

The description given here by the Delphi participant certainly does not give the impression that all of the land within the block is intensively used for housing, subsistence agriculture or any other use. The fact that these areas of housing are so central within the city mean that they offer the highest levels of accessibility to employment and services etc. However, the inefficient way in which the space is being used means that the numbers of people within the urban population able to enjoy such accessibility is not being optimised.

It is interesting to consider that the concept of the patio pervades different income levels in Nicaraguan urban society. The Delphi participants talked about low income families generally aspiring to own their own ‘detached‘ structure (maybe small but ideally detached) and have a patio while high income urban families, despite not engaging in the production of food at home, continue to defer to the rural mindset when talking about what a home should look and feel like.

It is obviously the case that including space for patios in plots considerably increases the size of housing plots, thereby reducing urban housing densities and making it more difficult to reduce problematic urban sprawl. The participants were clear that the cultural acceptance of the patio, and what could even be described as the cultural acceptance of the need for each dwelling to have one, was a major barrier to residential densification. While housing expectations were tied to the patio - and a significant sized patio at that, working towards more sustainable models for urban development would be difficult.

Figs.6.9 and 6.10 below provide an example illustrating some of the themes above.

housing 1 family. The development was built in the 1980s by central government and the apartments were given to families at very little cost to the families.

The families occupying the apartments on the ground floor have requisitioned and walled in the space that was provided in the original design of the building for the shared use of all 6 families. The once shared space is now accessible exclusively to the ground floor inhabitants and is currently used for a mixture of subsistence agricultural activities and small scale automative repairs.

Such was the ground floor families' sense of entitlement to having a private patio area that they built physical barriers to ensure for themselves private use of what was formally a shared space.

Fig.6.9

Fig.6.10. Photograph of a multi-storey residential structure in the city of Leon (photograph, Morton 2011)

Interestingly a set of similar multi-storey housing blocks in Matagalpa, the Cancha Brigadista housing development, which consists of 4-storey blocks, has not experienced incidences of residents occupying shared space for themselves. Both developments were built by government during the 1980s although Cancha Brigadista is located in a far more central urban area than the FUNDECI development. A participant from León identified the problem at FUNDECI, saying that:

> I think there are two main factors here. One is that there is not the culture or the resources in local government to monitor or penalise incidences like this, small private landgrabs really, where people are extending private plots. This is a general problem, not just where the result is a bigger patio. The other factor is the driving force in this case, that there is almost an expectation now among Nicaraguan people to have private outside space to cook, wash and even do business from home. This is obviously regardless of the realities of the circumstances or of the problems caused to neighbours as you can see in this case. It must be unbelievable to you that the people on the ground floor in the FUNDECI case have even put up metal to enclose the space.

A participant working in academia, discussing the difference between the Cancha Brigadista and FUNDECI developments stated that:

> Maybe the difference between the FUNDECI project and the Cancha Brigadista one is that the shared areas of Cancha Brigadista are more visible to the wider community and to the city. It is in a more prominent position. Maybe there are more public facilities and spaces closer to Cancha Brigadista – the cathedral square is not far and the Cancha Brigadista itself (a public sports venue) is just nextdoor. Also, from that position in Matagalpa the people in those towers have views to the mountains and maybe a feeling of space without having to 'steal space.' Or maybe in

> Matagalpa the people are just more accustomed to a denser urban form and don’t have so much expectation of their own large private patios.

6.4.2 Theme 2: Governance and density in Nicaragua and the case study cities

6.4.2.1 The widespread culture in national and local government of ‘political appointments‘ including in key posts in urban planning and housing

Barack Obama, on becoming president of the United States of America in 2009, said the following in his inaugural speech:

> *“To the people of poor nations, we pledge to work alongside you to make your farms flourish and let clean waters flow; to nourish starved bodies and feed hungry minds.”*

(Obama, 2009)

Across the global south, millions of minds are hungry and are in much need of nourishment. In the author’s time spent traveling to poor countries around the world, one of the most powerful sources of dissatisfaction evident when talking to many people is the sense that, no matter how hard they work their country will never provide them with the opportunity to progress professionally in a field they find fulfilling. What is so disastrous about this phenomenon for a society is that it eats away at people’s sense of motivation and self worth.

Based on the author’s own observations and the input of the Delphi participants, this state of affairs is particularly marked in Nicaragua. A common refrain when people discuss their disappointing lack of career opportunities is, “what do you expect, this is Nicaragua!” Commonly, people do not feel that career set backs are momentary, temporary or something that can be overcome by learning and doing things more effectively next time. Career set backs are seen as being part of structural inadequacies and inequalities in society and therefore totally outside of an individual’s control. In some countries around the world, it has been noted that this type of situation can make citizens more prone to reckless behaviour. It can also result in people being unable or unwilling to plan for the future in any meaningful way or forego short-term gain in the present for the sake of greater long-term gain in the future. In Nicaragua, the disappointing lack of career opportunities for the many leaves an extremely large section of the population feeling permanently unmotivated and believing that ‘to hope is hopeless.’

A critical factor contributing to this situation is the central role that nepotism plays in determining who occupies which jobs and in charting certain people’s career progression. Nepotism is widespread, including - some would say especially - in the public sector. In Nicaragua the term ‘political appointment‘ is often used to describe the appointment of a person to a post without there being a fair and transparent process to advertise the post and/or to select the best candidate for the job. The responses of the Delphi participants and the author’s own observations revealed that political appointments are very common in the local governments of all 4 case study cities - and particularly common in Granada and Matagalpa. Political appointments are also extremely common in central government ministries and in public sector agencies operating at arms length from government. Within all of these publicly funded organisations the areas of urban planning and housing are very much affected by this phenomenon.

Political appointments are damaging not only because they directly bias people's chances of beginning or progressing in a career but also because they reduce the effectiveness of the organisations involved as those appointed are often not the best people for the job, even within the pool of people who know about the availability of a post. More widely the effect of political appointments is particularly toxic as they create feelings of hopelessness and bitterness in the many without access to nepotistic influences. In addition, the damage to publicly funded institutions in Nicaragua is that it creates a lack of trust in political institutions and the political structure. It is also difficult to convince the wider public of the importance of residential densification and promote a wider interest in planning and housing if the process of political appointments continues and continues to ostracize people from the work of local government.

The Delphi participants revealed that there is no system for formally advertising posts that become available in local government and the only way of finding out about such vacancies is through word of mouth. It also became clear that there is also no formal system for conducting a recruitment process. Although the exact process by which people become employed in local government in the case study cities differs from situation to situation it normally follows a structure that can best be described as head hunting. A interview/informal chat may take place which is as much to organise the practicalities of when the candidate would begin and what the job entails as to find out whether the candidate matches the requirements of the job.

There are various modes of accessibility by which a person can find out about a vacancy and be able to organise 'a chat' about the post. These modes include having an existing connection to people with influence in the organisation through family or friendship or possessing ‘political capital’ having developed a name for themselves through political activism with the political party running the local government in question. Something that works to disrupt continuity is when control of local government passes from one party to another after local elections. The Delphi participants explained how this often results in the ‘cull’ of a large number of local government staff who had obtained their posts under the ancien régime. In the UK, these people who are not elected members/councillors are known as civil servants and their employment is generally independent of the election/un-election of councillors. The Delphi participants - non of whom of were elected members - spoke with genuine trepidation when they considered their probable ousting in the event of the current political party in control losing power.

The Delphi participants were very clear and open in describing the recruitment process. It is interesting to note that it was the participants themselves who introduced the author to the term ‘political appointment‘ - which they were clear indicates an appointment which has not observed a fair and transparent process of selection. Looking at the situation from a UK perspective the appointments of all of the Delphi participants employed in local government look like political appointments. However, the participants really only used the term to describe the appointments with the most extreme mismatch between the appointee and the post. In the judgement of the author a minority of the participants were examples of this mismatch. Although, this minority of participants possessed knowledge of planning and housing which was sufficient to contribute productively to the Delphi process - especially considering the absence of other more knowledgeable people in the cities concerned - they were clearly very significantly less deeply aware than the majority of the participants about issues concerning sprawl, housing density, ideas of the compact city and residential densification. That the majority of the participants were considered by the author to be relatively deeply aware of the issues and were able to offer a multitude of relevant examples from practice means that the system of political appointments does not completely fail to bring in knowledgable, capable and experienced people; it just isn't fair!

The prevalence of political appointments in the areas of urban planning and housing in the institutions discussed forms a key barrier to residential densification - and indeed to progress in any area of planning and housing. A critical point is that if decisions over recruitment are determined 'politically' - through nepotism - than the supposed central purpose of recruitment, namely to find select the best person for the job, is lost. In the case study cities this means that local government is not doing as good a job as it could be doing in the areas of policy, development control and project planning. This is true for the day to day functioning of the institution and the deployment of its duties to the public but also critically in terms of its ability to conceive and develop new ways of working to adapt to changing urban realities. More compact urban development and residential densification are relatively new and even niche ideas at present in Nicaragua and hard work, vision and creativity will be required from capable and talented professionals to make progress in these areas. Even if this did happen it will be challenging for such planners and housing professionals to convince others such as professionals in other areas in government, elected members without much knowledge of planning/housing and the public of the merits of adapting to a new way of living.

The practice of political appointments can lead to policy, practice and general approaches to doing things in the institutions affected being dominated by a recycling of old ideas and values. Political appointees clearly have no interest in ‘rocking - or even slightly tilting - the boat.’ New people with fresh ideas and values, but without ties to people who already hold power and influence in government find it difficult to gain access. This forms a major barrier to residential densification taking place in the case study cities as without being introduced to new ideas it is unlikely that local government will fully commit itself to supporting residential densification and making it happen. Even if that commitment was present, creativity is required to devise ways of promoting to the public the advantages of a more compact approach to residential development. New ideas and fresh approaches can clearly be useful for stimulating creativity.

The Delphi process identified numerous examples of political appointments to planning and housing posts in local government in the case study cities which have resulted in the recruitment of people without appropriate ability, knowledge and experience. There were 2 ways in particular in which the recruitment of deficient candidates was particularly damaging to progress towards residential densification. One was where candidates appointed to highly technical positions, such as director of planning policy, did not possess all or many of the areas of technical expertise required - either that they had not obtained enough experience after graduating from university or that they had not even studied a related subject at university. Another way was where candidates appointed to very senior positions, for which a large proportion of duties were centred on providing leadership and managing other members of staff, were not experienced or skillful in these areas. The Delphi process made it clear that such appointees damaged staff morale and motivation and were not capable of providing inspiring leadership.

Political appointments mean that the human capital of well-trained, capable people in Nicaragua, often with technical training and expertise, is left unused. Conversely, untrained people without expertise and technical training, who may even be incompetent in terms of leadership, management and ‘soft skills’ are given posts and promoted and obtain a great deal of power and influence. Perhaps the greatest irony is that since 2006, Nicaraguan national government has been controlled by the socialist Sandinista party, who also control local government in León, Masaya and Matagalpa and have recently been in power in Granada. This political entity was a key force behind the 1979 popular revolution to overthrow the nepotistic and tyrannical regime of the Somoza family dyansty. However, in contemporary, Sandinista controlled Nicaragua, nepotism and political appointments continue.

Finally, the Delphi participants explained that the phenomenon of political appointments extends to recruitment by national public sector agencies which operate at arms length from government. The highest profile example of this taking place identified by the Delphi participants was the recruitment of the current head of the Insituto de la Vivienda Urbana y Rural (INVUR) <Institute of Urban and Rural Housing>. In fact, the participants spoke about seeing the head of INVUR deliver one of the keynote speeches at a conference on housing in León in 2009 which the author also attended. The speech given made it abundantly clear for anyone with expertise in housing that the head of INVUR did indeed know very little about housing. In fact, suspicions that the individual concerned was given their position simply because of their political alliances to the national Sandinista regime were given greater weight as the speech, which was supposed to be about sustainable models for local government housing projects, consisted only of 2 components: wild, baseless and inaccurate claims about the basics of housing in Nicaragua and a structureless diatribe providing the speaker's version of Sandinista political victories in the 1980s Revolution, almost none of which had anything to do with housing.

6.4.2.2 Lack of understanding of urban planning and housing issues including density by elected members in national and local government

Almost all of the Delphi participants stated that a major barrier to residential densification was the lack of understanding of elected members in government on matters of planning and housing. The participants were aware that this was a significant problem at national level but they were able to provide the most vivid picture of this problem at local government level. More specifically, according to the participants, local councillors were simply not aware of the problems caused by low-density urban sprawl and most were unlikely even to know what it was. The Delphi participants made it clear that they understood that based on the general premise of elected local government, which applies worldwide, local elected members come from a variety of backgrounds in terms of qualifications and experience. The participants did not expect councillors to be fully trained or experienced planners or housing professionals. However, what participants complained most about was their general experience of elected local members being uninterested in learning more about planning and housing and the issues within these areas which required their attention as local politicians.

Although a lack of understanding of elected members in government on matters of planning and housing was a problem identified in all 4 case study cities, the Delphi data suggests the problem is most severe in Granada and least severe in León. For example, Granada's local politicians have failed to maintain the city's C2C partnership with Dordrecht in the Netherlands, a relationship which gave access to support and advice from Dutch urban planning professionals. The Delphi participants from Granada lamented this greatly. Contrastingly, León's C2C partnership with the Dutch city of Utrecht has gone from strength to strength and has now endured for over 20 years. Within this partnership, a major focus that has evolved over this time has been the formal relationship between urban planning and housing professionals in the two cities, which enables the sharing of good practice and resources. Successive mayors and councilors representing León have been at the forefront of pushing the partnership. Indeed, the León-Utrecht partnership has become a model C2C relationship in Nicaragua. Delphi participants in both cities made clear that it was primarily the role of local politicians rather than civil servants to maintain and/or invigorate C2C partnerships. In León, one housing professional, in particular, is a key and enduring figure in the partnership with Utrecht but this person requires the political will of the mayor and councilors to keep the partnership going.

Another issue which Delphi participants claimed forms an obstacle to residential densification was the poor communication which generally exists between civil servants employed in local government in posts in planning and housing and the elected members. Participants described how they believed that elected members often had an elevated view of themselves and the level of their own importance within government and the city which they represented. Across the spread of

Delphi participants, it was considered that elected members made relatively little effort to seek the professional opinion of civil servants. Councillors were also notoriously difficult for civil servants to arrange to talk with, at least for those civil servants without an existing relationship with a specific councillor. During the Delphi process, the animosity which the participants often showed towards elected members and the mistrust demonstrated towards the nature of councillors' true motives were palpable.

In part A of this section, it was found that it was common for civil servants in Nicaragua including in local government in the case study cities to be recruited by way of political appointments and this meant that their level of training, expertise and experience for their post could not be assured. However, despite the fact that this situation meant government was not 'casting the net wide' in its search for new recruits many of the civil servants that the author encountered did possess training, expertise and experience in planning and housing. Some were ludicrously deficient in terms of their skills set for the posts they occupied but many were not. It is important to note for the purposes of this section that the level of understanding on planning and housing of most civil servants working in this field greatly exceeds that of most elected members. On this basis, any type of relevant communication between the 2 groups would be beneficial for improving the councillors' level of preparedness to deal with and respond to the planning and housing issues facing the case study cities.

Delphi participants explained that one of the symptoms of elected members' lack of meaningful engagement with planning and housing that they felt most keenly was an absence of leadership. One of the duties of elected members at national and local level is to provide the institutions of government with effective leadership and in particular to lead necessary change. Participants thought that an important part of effective leadership is to gather data, findings, conclusions and professional opinions and advice from where it is available in an organisation to build up the most accurate possible picture of current realities and needs. What the participants saw as a lack of interest on the part of elected members meant this was not happening. The majority of participants stated with conviction that they thought planning and housing as professional areas in Nicaragua were rudderless because of this lack of leadership. As an example, a number of the Delphi participants spoke about the elected member of the national parliament who leads the parliamentary housing committee. He gave a keynote speech at the conference on housing in León in 2009 that was discussed in part A of this section. His speech was supposed to provide some sort of insight into sustainable models for local government housing projects. He was equally inept at doing this as the head of INVUR had been and similarly to the head of INVUR demonstrated an almost complete lack of understanding of the realities of housing in Nicaragua. The leader of the housing committee's speech contained just enough on housing to show that he knew very little about it and consisted almost entirely of a ranting story of the Sandinista party’s role in Nicaragua’s Revolution in the 1980s.

6.4.2.3 Lack of impact of national government housing agency (INVUR)

The Delphi participants identified the Nicaraguan Insituto de la Vivienda Urbana y Rural (INVUR) <Institute of Urban and Rural Housing> as the entity at national level which, at least nominally, had most responsibility for planning and housing development. This organisation has powers enabling it to produce policy and guidance documents and plans aimed at contributing to the national legal framework governing housing and housing development (although before becoming ‘active’ these documents must be approved by the elected Nicaraguan National Assembly). However, according to the Delphi participants, since INVUR’s inception in 2002, the documents it has created and the general role it has played have not had a significant impact on the way housing is planned and built in practice. This includes a lack of impact on how local plans and masterplans are formed and how development control decisions are made in response to proposals for housing developments. INVUR’s deficiencies and lack of impact in the case study forms a further obstacle to residential densification. As the national organisation notionally responsible for housing it should be taking a lead role in improving understanding about low-density urban sprawl and related issues in Nicaragua and making the case for positive change. Nicaragua currently has an organisation which is not fit for purpose in this respect.

6.4.2.4 Inconsistency between one local government and another in the planning frameworks affecting housing development and housing density

Slightly over half of the Delphi participants identified that a huge variation exists between the planning frameworks which had developed and are currently used in different municipalities across Nicaragua. Concerning the case study cities, there is significant variation between the planning frameworks used within the municipal governments. In each municipality, the frameworks which govern how urban plans are formed and how they influence decision making and how development control powers are deployed are based on a set of unique locally produced documents. The participants described a situation whereby in each municipality the key planning documents which set out planning principles, procedures, guidance for decision makers and relevant legislation for the municipality are an amalgam of extracts from national texts (such as the NTON suite of documents - a description of which is available in fig.6.11) and local municipal orders (which are described in fig.6.12). In each municipality, the process of selecting extracts from national planning texts, forming municipal orders and composing the city’s key planning documents have been done independently. None of the Delphi participants were aware of any significant cooperation, and certainly no formal cooperation, between different municipalities on this process. In addition, in each municipality these key planning documents are added to over time and again this is done independently in each municipality. Consequently, it would be purely coincidental if the key planning documents in each municipality bore much detailed resemblance to each other. Even the common link between municipalities: that they are able to use material from the same national planning documents, is tempered by the variation in how much staff in each municipality are aware of these documents.

The Nicaraguan Obligatory Technical Norms (NTON)

In Nicaragua, a national suite of planning regulations and guidance exist which are known collectively as the NTON.

A number of participants identified the Nicaraguan Obligatory Technical Norms (NTON) as the documents coming from national government which have the most impact on how planning is done in their cities. Participants from all 4 of the case study cities reported this. In particular, they reported that, specifically the NTON documents 'The Minimum Norms for the Dimensions of Housing Developments' and 'The Minimum Norms for Accessibility' have most impact on how new housing is developed, planned and built. A participant working in development control for local government in one of the secondary cities - whose job forms part of the state's role at a local level to set development control procedures and and interpret them on a case by case basis - illustrated the central role the NTON documents play in his/her work, commenting that:

> *We here in the department deal with the NTON which are the Nicaraguan Obligatory Technical Norms ... When there is a proposal for a housing development, based on what we expect from the NTON I demand a series of requisites of the proposal and I oversee any pertinent revisions to the designs*

This participant was also able to confirm that the various NTON documents are indeed a central government creation. He/she explained that "the NTON were basically born from what are called ministerial decrees." Both this participant and a number of other participants stated that the two specific NTON documents identified above which are most concerned with regulating housing were produced by the central government Ministry of Transport and Infrastructure.

As part of NTON generally, minimum standards are stipulated for the width of road verges and central reservations, the width of roadways and streets of different types (e.g. principal inter-city highways, major trunk roads, minor trunk roads and neighbourhood roads with a low frequency of motor traffic) and the space between neighbouring detached homes planned as part of a single housing development.

The majority of Delphi participants observed that overall these minimum standards were overgenerous and that the observance of these standards made Nicaraguan cities susceptible to urban sprawl. The majority of participants expressed concern that these minimum standards were leading to outcomes where land was developed in a very inefficient manner.

Of the numerous examples of national government documents or municipal orders encountered during this research, i.e. providing policy, guidance or legislation, the NTON minimum standards were certainly among the most consistently used within the planning frameworks of the case study cities. Also they contained principles that were among the most consistently implemented in practice in the case study cities. In terms of the challenges of working towards more compact urban development, this is rather ironic as of all the national documents or municipal orders that the author is aware of it is perhaps the NTON minimum standards which work against the principles of compact urban development in the most direct and clear cut way.

Fig.6.11.

Municipal orders

Delphi participants were also able to identify that local government is also a source of the norms and regulations which govern planning and including housing development. Participants explained that each municipal government in the country has powers allowing it to write regulatory and policy documents with legal functions applicable only within its own municipality. These municipal documents, known as municipal orders, operate alongside the documents originating from central government, which are applicable nationally. An participants who works as a historic conservation officer for local government in one of the secondary cities stated that the local validity of municipal orders comes from the fact that they are “approved by the council,” referring to the body of elected local politicians. Some participants expressed concern that regulatory and policy documents originating from central and local government sometimes clashed.

Fig.6.12.

The Delphi participants revealed that some municipalities in Nicaragua, particularly smaller ones though not including any of the case study cities, may have not developed any planning documents to guide practice at all. As such their planning practices are not centred around any written information which decision makers or the public can refer to. Some of the Delphi participants reported that they knew that staff in some of these municipalities were even completely unaware of national planning documents such as NTON and did not know that they have the right to compose written municipal orders which can influence planning. In Nicaragua’s smaller municipalities the number of civil servants are likely to be extremely small, possibly not including any specialist planning posts.

The situation described so far in this section constitutes a major barrier to residential densification. Even if national government or one/some municipal government(s) were fully aware of the problems of low-density urban sprawl and wanted to work through the planning system to bring about a reduction there is no mechanism to share good practice by making the same changes to multiple municipalities. All the municipalities not only have their own planning system but their own system for drawing up the key documents on which the system rests. Making changes to different municipalities to reflect a common notion of good practice would require detailed negotiation with each municipality separately and would need different things to be done to the different forms of planning governance in each municipality. In many countries around the world, if national government wishes to make changes to planning across the country it can release a national planning guidance or policy document or new legislation, knowing that this will directly become part of the material considerations for planning in local municipalities. In Nicaragua, national government can produce these documents but there is no universally recognised system for - or need for - local municipal governments to adopt these documents directly as part of their planning system.

The variation from one local government to another described here also makes it almost impossible for people from one municipality or people at a national level to understand the way ‘planning is done’ in another municipality. It is therefore extremely challenging for anybody to become well versed in ‘Nicaraguan planning’ and to successfully advocate positive change, e.g. embracing more compact residential development patterns across the country or even across a region.

6.4.3 Theme 3: Professional development and dialogue on ideas for Nicaraguan urban development professionals

As regards professional areas within the field of urban development in Nicaragua, such as urban planning, housing, community development, project planning and external cooperation, the concept and practice of continuing professional development and encouraging professionals to engage in dialogue on ideas is relatively neglected in Nicaragua. The Delphi participants who work in local government made it particularly clear that this is the case for the professional areas that they work in within the municipal governments representing the case study cities. This sentiment was not so strongly expressed by the Delphi participants working in academia but they were unable to describe any significant examples of professional development taking place.

One of the few ways in which continuing professional development and encouraging professionals to engage in an dialogue on ideas does occur is through city to city (C2C) cooperation. The C2C partnerships which have been most organised, strategic and enduring in doing this in Nicaragua have undoubtedly been the partnerships between Nicaraguan and Dutch cities.

This issue affects the ability of professionals to develop their thinking on planning, housing and specifically density issues but also affects their capacity to share ideas once they develop them.

Nicaraguan urban development professions would have far greater capacity to respond to the country’s requirements in the area of urban housing and to incorporate elements of the latest international thinking if there were increased opportunity and ambition for international professional engagement in the country.

For example, in areas like strategic policy planning and in the technical aspects of earthquake resistant higher-density construction - both of which are discussed in this thesis as areas where lack of knowledge and experience creates major barriers to densification - greater and more effective work based collaboration with professionals and academics outside of Nicaragua is critically required.

6.4.3.1 A historical focus on project specific international cooperation projects at the expense of professional capacity building

The 1980s in Nicaragua were a fertile time for the formation of programmes of international cooperation. However, with the notable exception of those operating under the auspices of the Association of Dutch-Nicaraguan Municipal Cooperation Programmes there was normally very little or no focus on professional capacity. The majority of programmes did not focus on professional development or capacity building at all, instead being concerned with the completion of highly specific projects, albeit with some impact on the provision of basic services. Typical projects have included the completion of events for cultural exchange involving music or dance, the building of single school buildings with the provision of textbooks and the installation of water pumps in a specific location by technicians from outside Nicaragua working as volunteers. According to the Delphi participants this ‘deficit’ of professional development and capacity building has very markedly reduced the potential in Nicaraguan cities for residential densification and the development of efficient cities without sprawl. Delphi participants remarked that professional development/capacity building particularly in the area of strategic policy planning and the technical aspects of earthquake resistant higher-density construction would be beneficial.

As well as noting the patterns common in all of the case study cities, as described above, it is also useful to note the differences from one case study city to another in terms of the attention paid to professional capacity building. Such differences exist, even amongst the programmes that are part of the Association of Dutch-Nicaraguan Municipal Cooperation Programmes, which have generally led the way in capacity building. The León-Utrecht partnership has demonstrated the greatest, most consistent and longest lasting attention to professional capacity building. As well as showing, by far, the most activity bringing Dutch and Nicaraguan professionals together to debate and exchange good practice - sometimes in Nicaragua, sometimes in the Netherlands and sometimes using internet-enabled communication – the partnership has also conceived and developed a programme of events to bring Nicaraguan professionals from different parts of the country together. For example, while in León I attended a conference, organized by the León-Utrecht partnership to discuss the planning and economic management of urban extension developments in Nicaraguan cities. Planning, housing and international cooperation professionals from Nicaraguan local governments representing urban areas were invited.

The Granada city plan document, which outlined plans for an urban extension to the city, showed a great deal of evidence of exchange of ideas and competencies through the Granada-Dordrecht partnership. However, ultimately exchange finished there and there was no programme of capacity buiding to look at the implementation of the plan or as time went on its review and updating (also see theme 4). The Granada-Dordrecht partnership eventually broke down completely and no longer operates.

In Matagalpa, the partnership with Tilburg contributed towards situation analyses of the city and a proposal, formed in meetings of local councilors, local professionals and Dutch professionals and partly expressed in written plans, to develop a significant urban extension area on the other side of a mountain which forms the periphery of the current city. However, professional capacity building and exchange has diminished in the partnership to the extent that the plan is now ruddlerless, is still discussed by professionals in Matagalpa as ‘the plan,’ but shows no signs of ever beginning in practice (also see theme 4).

6.4.3.2 Being “isolated from the rest of the world” in terms of professional capacity building

Independent of organised programmes of international cooperation, the Delphi data has highlighted the difficulties that participants and their colleagues have in accessing detailed and reliable information about the latest international conceptual and technical developments on compact urban form, residential densification and on key areas across the urban planning/housing spectrum. In addition, the Delphi participants spoke about the difficulties they had in obtaining information about examples of good practice from outside Nicaragua.

The lack of access to professional development/capacity building and to information as described above made the Delphi participants feel isolated from “the rest of the world” professionally (policy planner in León). Some spoke of feeling as if they were held back in their professional experience and standing because of Nicaragua’s relative isolation from the global circulation of dynamic new ideas within the realm of urban development professionals.

One of the major practical factors exacerbating Nicaragua’s isolation was that the provision of communication media was limited, expensive and often unreliable. Hardware, such as computers and other electronic devices, is expensive in

Nicaragua, especially when compared with average income. Books and magazines are also expensive and academic and trade journals are mostly unavailable both in print and electronically - as institutions are rarely subscribers. In addition, internet provision is not comprehensive and is expensive. It is also often slow and connectivity can be unreliable. Very few people have internet service in their homes and in places of employment there is also often little or no provision. For example, all 4 of the local government offices at which Delphi participants worked had no or very limited internet connection. In Granada, the municipality had had all internet provision and even its electricity supply cut off because of a succession of unpaid bills. In León, Masaya and Matagalpa access to the internet was only available to a very limited number of senior members of staff and even then the service was slow and unreliable.

In addition, computer software products which are considered a mainstay across the world within urban development professions are unavailable to the Delphi participants because the institutions they work for consider them unaffordable. For example, the full and most up to date versions of the AutoCAD product for architectural, urban planning and other design was unavailable. The Delphi participants were not even aware of Building Information Management (BIM) software products as well as not having them available (can describe possible use of BIM as a solution to overcome the barrier to help communicate/collaborate within Nicaragua and internationnally inc with other developing countries and developed countries inc twinned cities etc).

Land surveying equipment that was available to the Delphi participants was in most cases of the most basic kind and in some cases was limited to measuring tapes and yardsticks. Only one of the participants who worked in academia had access to more sophisticated land surveying equipment because of his senior position. The equipment had been made available because the university he worked for had cooperated with international groups on certain projects.

6.4.4 Theme 4: The formation of policy in the areas of planning and housing, including on residential densification and its implementation

Where urban planning and urban housing policy has proposed changes in the case study cities linked to more compact urban development and residential densification, very serious problems with policy implementation have often resulted in these changes not taking place. This theme explores the barriers to residential densification related to the implementation - or non-implementation - of policy which has already been formed.

The challenges of policy implementation in developing countries are well noted in academic literature. From the Delphi data, poor policy implementation emerged as one of the most significant factors holding back progress towards more compact urban development and residential densification in the case study cities. Poor policy implementation also resulted in some of the most alarming cases of wasted time and money encountered by the author during this study.

6.4.4.1 An example of policy implementation - or non-implementation - in the case study cities

In all of the case study cities, a vast amount of time and resources have been invested in the production of reports characterising the current state of the cities in terms of housing, infrastructure, basic services and public space etc as well in the formation of city plans and other supporting documents. In all 4 case study cities, the city plans and supporting documents went into a very substantial amount of detail in generating a vision for the cities' future, typically to be achieved within 10, 15 or 20 years. These plans are at various stages of their supposed life cycles in the different cities - in some of the cities 50 or 60% of the supposed duration had already elapsed at the time research for this study was conducted.

In each of the cities, the city plans and supporting documents included an in-depth indication of the sites favoured for future housing development. In all of the cities except for Masaya, this included sets of very prescriptive plans for urban extensions on large pieces of land peripheral to the existing cities. This incorporated detailed information about the design, layout, density, building materials and even the cost to the buyer of the housing within the urban extensions.

In each of the case study cities, the status reports, city plans and supporting documents related to the plans for urban extensions were researched and written by the Nicaraguan local authority working in partnership with the local authority of the Dutch city that they had a relationship with. These partnerships all operated under the umbrella organisation the Association of Dutch-Nicaraguan municipalities.

At the time that this research was conducted, the city plans and the housing they prescribed enjoyed different levels of completion. Progress on all of them was very significantly behind the schedule planned in the documents signalling that there had clearly been issues with policy implementation. In fact, in Granada it looked very certain that the much planned urban extension would never even be started, in Matagalpa it seemed the same. Particularly in Granada, one of the most worrying aspects of the lack of policy implementation was that, reading the plans in retrospect and being aware of the conditions in the city, the plans looked almost completely like fantastical works of fiction, with little or no connection to the social, economic and political realities in the city. A major problem seemed to be that the local authority/international cooperation partner authorship of the plan seemed to have massively overestimated the level of control the local authority had over directing the development of land that was privately owned.

In Masaya and particularly in León progress had been better. In a ‘rare departure’ from looking at the negative picture of barriers to residential densification as is the focus of this part of the thesis, here, a little more positive ‘colour’ will be added to the picture and the partial completion of the urban extension in León is discussed.

6.4.4.1 Looking at the partial completion of the urban extension plans in León

At the time of this research, of the urban extensions which had been planned in each of the case study cities, progress was by far the most advanced in León. The León South East urban extension had seen significant progress. Approximately, 65% of the land identified in the plans as part of the urban extension had been purchased by the local authority from the original private land owner without the need to employ compulsory purchase legislation. The fact that land had been secured was perhaps as much a result of the relatively poor quality of the land for agriculture as other reasons such as effective management of the land purchasing process. 3 Delphi participants indicated that the land had little agricultural value as it had been left relatively infertile by a history of intensive cotton cultivation. A further 4 Delphi participants from other cities pointed out that securing land for housebuilding had been easier in León than in their own cities because of the relatively cheap land prices on León's periphery.

In the León South East urban extension progress had been made on creating plots within the land and installing infrastructure and basic services. The area of land which had been secured by the local authority in León at the time this research was conducted had a single tarmaced main access road and a network of more minor non-tarmaced access roads. This road infrastructure had been provided by the municipality of León working with that of Urehct. A series of relatively large plots had been laid out as public leisure spaces, none of which were completed but two of which had rustic basketball courts/5-a-side football pitches. There was a rudimentary supply of electricity to the area, though not all sectors and plots were covered. Most sectors and plots had access to drinking water and had been connected to a sewerage system. Consequently, the plots did not have to use septic tanks. A network of breeze block lined stormwater drainage channels had also been provided along the access roads. The majority of the land had been divided into plots to accommodate single dwellings. The plots were all of similar - though not always exactly the same - size and most had direct access to a non-tarmaced access road.

All of the progress described above which has taken place in the León South East urban extension area was planned, paid for and implemented by León's local government and the municipal government of Utrecht in the Netherlands. In fact, the majority of funding had come from the Utrecht municipality and ultimately from Dutch taxpayers. A scheme had been set up whereby plots were provided to families, who received legal title to the land, in return for the families signing agreements to repay the cost of the plot - or at least part of the cost - in monthly quotas over a period of 10 years. The funding to purchase the land had been provided by the municipality of Utrecht and the residents' repayments were then reinvested into the scheme, under which there were plans to purchase more land for housing and improve the coverage and quality of the road system and utility provision. This system was referred to by the Delphi participants as a "revolving fund."

6.4.5 Theme 5: Very little new house building, residential infill development not taking place and a shortage of actors capable of and willing to build new houses

6.4.5.1 High demand for housing in the case study cities; and significant amounts of vacant land in existing urban areas presenting opportunities to meet demand via infill development leading to residential densification

As was made clear at an earlier point in this thesis, the population of Nicaragua's secondary cities - including for all of the case study cities - is increasing rapidly. In addition, there are signs that in Nicaragua's urban areas, the newest family units, i.e. young adults with children, are increasingly determined to live in their own dwellings as opposed to living in the often overcrowded conditions of the traditional home shared with the entire extended family. As a result, there are currently unprecedented levels of demand for housing in Nicaragua's secondary cities. In an earlier chapter, data was examined which illustrates this situation and it was clearly evident that housing demand was at a critical level in the 4 case study cities.

In these conditions, significant levels of supply of appropriate housing is required to meet demand and avoid problems of overcrowding and homelessness from getting worse. As has been made clear in previous chapters in this thesis, housing densities in the case study cities are generally low and there is a great deal of vacant land within urban areas which does not have any worthwhile function. In order to meet the twin requirements of providing housing supply and raising housing densities there is a need to develop housing on vacant land within urban areas which does not have any existing positive function. Such an approach is known as infill development.

All of the Delphi participants were able to confirm the general picture of rapid population growth and very high demand for low income housing in the cities in which they worked or had working knowledge about. Many of the participants also highlighted that the extended families currently inhabiting overcrowded conditions typically consist of a number of individual ‘nuclear families’ (for example, different siblings or even different cousins with their own partners and children). It was also pointed out that there is often a desire on the part of individual ‘nuclear families’ living as part of an extended family to find their own living space. In addition, to natural population growth in the case study cities and migration to the cities this phenomenon of individual nuclear units wanting their own individual dwellings further contributes to housing demand.

In Granada, the added issue of the city’s new international residents was identified. Participants from Granada and other cities stated that it is the most prominent tourism city in the country – the very popular beach destination of San Juan del Sur being a much smaller settlement and a town rather than a city. For approximately the last two decades, Granada has attracted increasing numbers of expatriate residents, mostly from Western Europe, Canada and the USA. This has created additional demand for housing and has transformed the market in historic colonial style properties in central areas of the city. Considering specifically the effect on housing demand among low-income Nicaraguans, although expatriates do not target low-income housing directly, participants explained that they have displaced low-income families from historic colonial style housing in central areas, which they then renovate. The displaced low-income families then add to the numbers requiring housing from other housing types. Expatriates also displace middle and high income Nicaraguans from historic colonial style housing in central areas, Nicaraguans who then occupy housing from other types, raising the cost of this alternative housing and threatening access for low-income families.

León is the site of Nicaragua's most prestigious university and by a great margin the biggest outside of Managua. Participants identified that in León, the large student population significantly adds to demand for housing. One of the participants from León said the following about the situation:

> *There is a lot of competition for housing anywhere close to the central areas of León. Students compete directly for cheap accommodation with local families, as well as other people who move into the city from other parts of the west and north of Nicaragua. Nicaraguan cities in general have housing markets that are not very active or accessible and in León there is a lot of demand without really the supply or the sales or rental mechanisms to go with it.*

All of the Delphi participants also identified that currently, in all of the case study cities, there is very little building of new houses. The majority of the participants reported that this has been a problem throughout Nicaragua's urban areas, particularly for low-income families, since 1990 when Nicaragua's socialist revolution came to an end. Without new house building by the formal sector - public or private - there is no chance of supplying the right type of housing, at the right price, in the right places and there is no prospect of achieving the consolidation of low-density urban areas with unused land into sites of efficient, compact development without urban sprawl. If housing which can help meet demand and contribute towards a more compact urban model is not supplied by the formal public or private sector then demand for new housing will be met by the informal sector, something that all of the Delphi participants were able to confirm is currently happening. The participants also made it clear that there is very little regulatory authorities can do to influence where informal housing develops and whether or not the choice of sites correlates with what is best for working towards the formation of more compact cities. In fact, participants confirmed the author's own observations that the very large majority of recently established areas of informal housing are located on the urban periphery where they create urban sprawl and fail to fill in the large amounts of vacant land present within existing urban areas. The situation described here forms a major barrier towards residential densification in the case study cities and the development of a more compact urban form for the case study cities.

6.4.5.2 Levels of new house building by the state very low in the case study cities

A major barrier to residential densification and more compact urban development in the case study cities is that formal house building is not happening in any significant way, particularly for low-income groups. It is not possible to develop a more compact urban form through infill development of vacant sites if formal house building is not happening. Informal house building is happening but it is virtually impossible for government to steer this type of development towards having it contribute towards more compact urban form via infill development.

6.4.5.3 Why are levels of new house building by the state very low in the case study cities?

As was stated in an earlier chapter, Nicaragua has seen a reduction in state involvement in house building since the beginning of the 1990s. This is a delayed consequence of political changes felt worldwide as part of the 'Washington consensus' - delayed because Nicaragua's Revolution during the 1980s insulated it from the pro-market forces approach embraced by the international community from the 1970s onwards.

All of the Delphi participants confirmed that there had been a vast reduction in the state's involvement in house building since the late 1980s. All of the Delphi participants were aware this was due to the drastic change in Nicaragua's political dynamics that had taken place since then. Some participants went further and explained that they thought that Nicaragua was now dependent on 'western' international lenders like the World Bank and the IMF and was, as a result, coerced into following a market forces approach to housing. This was despite the fact that the Sandinistas, a socialist political party, controlled the presidency and much of the machinery of central government. Some participants also added extra detail to the picture describing how in the 1980s the state's direct involvement in house building was funded to a large extent by financial and technical support from the Soviet Union and other allied socialist nations and sympathetic causes.

Just under half of the participants stated that, in their opinion, many of the people currently employed within central and local government - both politicians and civil servants - believed that the state should be building houses - mainly for the poor but there were also advocates of building for the economic middle classes.

One of the Delphi participants from León talked about the state and housebuilding in the following way:

> *I remember when the state could do what it wanted to do in the area of housing. Maybe the long-term strategy was not always so clear but the state could say, 'we have these people here who desperately need housing, let's do something about it.' Since 1990, it is the international financial organisations which set the strategy under which we all have to operate.*

All of the Delphi participants working in academia - who were perhaps particularly aware of the wider political picture regarding housing - stated that since Daniel Ortega's reelection to the presidency in 2006 as the Sandinista candidate, the Nicaraguan state was actually doing more housebuilding than other Central American countries. The level, however, was still undoubtedly significantly less than Nicaraguan pre-1990 levels. The participants working in academia attributed the greater levels of house building to Ortega's presidency, Sandinista domination in central government and their increasing power in urban local authorities. The participants explained the obvious appeal that state house building had for the Sandinistas as socialists. It was also explained that the origin of much of the funding for this housebuilding was the 'ALBA' initiative (described in an earlier chapter), with the funding and the projects being administered by Nicaraguan central government. However, 2 participants also said that they believed that many of the recent Sandinsta central government administered house building projects were ‘strategic‘ and populist bordering on contrived and electorally manipulative. They were also “99% located in Managua” according to one of the participants from academia.

The same Delphi participant from León who gave the account above of the new political-economic realities influencing the state’s approach to house building also gave the following description of the relationship between the ALBA initiative and house building by Nicaraguan central government:

> *Daniel [Ortega], working with [Hugo] Chavez and ALBA have done some projects but I think they have all been in or around Managua and, to be honest, I sometimes think they are a type of bribe, well, bribing people to vote for him again as president. Also, sometimes the president just does his own thing, like in this case in housing, and it doesn’t have anything to do with what the local governments are doing.*

In the above quote the claim is made of there sometimes being a mismatch between the work towards housing development done by central government and that done by local government. This concern was repeatedly expressed by the participants.

Most of the participants - both those working in academia and in local government - also identified C2C initiatives (see an earlier chapter for an explanation of C2C) as an important source of funding and technical support for housebuilding. The participants emphasised that this source was directed at housing projects administered at a local political level and that it was far less connected to Ortega's presidency or Sandinista political control than ALBA related sources of funding/support. However, participants explained that the level of housebuilding C2C was achieving, particularly in recent years was relatively low. León had by far managed to build most housing using these initiatives.

6.4.5.4 Low levels of new house building and relatively little provision of housing finance by the formal private sector

The previous section looked at why new formal house building is not occurring at any significant level in the case study cities by focussing on the role of the state. This section also looks at why there are such low levels of formal house building in the case study cities but focusses on the role of the formal private sector.

This study has already established that there have been significant reductions in levels of state housebuilding in Nicaragua since the early 1990s. The Washington Consensus was developed based on the assumption that formal private sector house builders, meaning housing development companies, would 'take up the reigns' of housebuilding activity from the state in developing countries and that this would provide both the poor and rich of the developing world with adequate affordable housing. A key accompanying component of this enlarged area of responsibility for the formal private sector was to be that privately owned banks would make housing finance available to all income sectors, allowing families to purchase the houses that were being built. Indeed, across the world since the 1970s, the World Bank, the IMF and the other large global funding bodies have invested very significant sums of money in trying to stimulate conditions whereby such private sources of housing finance become available. Nevertheless, as innumerable studies make clear, throughout the developing world the formal private sector has consistently failed to ‘step in’ as a provider of housebuilding and housing finance - most notably for the poor but also for much of the economic middle classes.

The Delphi participants confirmed that in Nicaragua, since the widespread removal of the state from housebuilding in the early 1990s after the country’s period of revolutionary government had ended, the formal private sector has indeed failed to build houses and provide housing finance for the huge majority of families. In particular, the formal private sector has very largely failed to take over from the state the role of house builder for the urban poor. This is in spite of the assertion within structural adjustment philosophy that private companies operating in the free market must take on the mantle of house builder for all sectors including the low income sector.

Private companies have not filled the gap left by the state post structural adjustment and for the country’s low income sector it has been left to isolated ALBA funded central government projects mainly focussed in Managua, international cooperation organisations, national NGOs and families themselves to build the limited number of formal sector housing units constructed in urban areas in the country since the beginning of the 1990s. Delphi participants described this situation in each of the four secondary cities. It is also a problem occurring in other developing countries around the world and has been identified by writers such as Helmsing (Helmsing, 2003).

Specifically regarding the low income sector, Delphi participants stated that they believed there is an enduring perception among private sector formal housing developers in Nicaragua that house building for the low income sector is unprofitable. The participants also recognised that there is no developed market in the country for the sale of existing housing for this income sector. As a result, poor families are effectively excluded from the private sector housing market. Another factor contributing to this exclusion is poor families' lack of access to Nicaragua's limited private sector housing finances market. On the whole, low income families are considered a risky investment by Nicaragua's lending institutions. The fact that many such families are dependent on informal employment for all or part of their income contributes significantly to this sense of risk.

The Delphi participants made clear that private enterprise is only building housing - and banks making finance available - for an extremely small portion of Nicaragua's population, corresponding to the pinnacle of the country's social and economic elite. One of the Delphi participants from Matagalpa summed up how private enterprise commonly views the matter in the following way:

> *Any Nicaraguan, let's say somebody that comes from the United States with some money to invest is probably not going to think of investing in housing. The only activity in this area that I am aware of is the development of housing for the high society. For people who want a swimming pool and have a lot of money to spend on a luxury house. Plus, because the numbers of these developments are so small, the cost per unit is higher, of course.*

In fact, the Delphi participants identified that there has traditionally been a general view in the Nicaraguan business community, and among international companies investing in Nicaragua, that housebuilding (or lending money to people for the purposes of buying dwellings) for markets across the income levels is never as lucrative a venture in the country as the extraction of natural resources or the production of garments for export for example.

Current levels of housebuilding performed by formal means, either by the state or the private sector, are clearly not high enough to meet the elevated demand for housing in Nicaragua. This gulf between supply and demand, particularly at specifications and prices that are suitable for the majority of the population, means that much of the housing being built, that is contributing to meeting demand, is constructed through informal means. Construction is by the informal private sector (construction by owner-occupiers) on land that has been obtained either through formal or informal means. As mentioned previously, it is virtually impossible for government to steer informal development towards a more compact form as government has so little influence on where and how development occurs. This situation forms a barrier to the building of housing which can contribute towards residential infill development and which could consolidate densities in existing urban areas.

Even if state planning authorities could find an acceptable way of forming plans to guide informal development to make it more compact, higher in density and more efficient in land use terms, such criteria would be difficult to enforce when the number of house builders are almost as numerous as the number of families occupying dwellings, i.e. most families are themselves house builders. This challenge is clearly exacerbated when, in addition, planning authorities are severely limited in the resources they have available to monitor housebuilding.

6.4.5.5 Challenges for the state to act as an enabler of housing

The concept of the ‘enabling approach’ to housing development in developing countries was explored earlier on. The approach can be seen as a type of ‘compromise’ position for the state to adopt, somewhere between the pre-structural adjustment tradition of the state as house builder and the minimal role for the state advocated by supporters of the free market approach to house building. Stein and Vance (Stein and Vance, 2008) describe an enabler’s primary duties as establishing a framework of norms and regulations, putting in place funding for land purchasing and organising core infrastructure and services. If the state in Nicaragua were to be able to act as an enabler of housing this could support potential private sector or NGO developers or those from the sphere of international cooperation in order to stimulate house building, thus making planned formal new house building possible and able to bring about infill development in appropriate places. Considering that the concept of the enabling approach is so topical within current academic literature on housing in the global south it is worthwhile analysing how close the Delphi participants’ description of the current role played by the state in Nicaragua within the area of housing development corresponds to that of ‘enabler.’

As has already been discussed at length, the Delphi participants made it clear that since 1990, the state has had very little involvement in the actual building of houses. This corresponds to the definition of an enabler’s role. The also participants explained that responsibility for “setting norms and regulations” (Stein and Vance 2008, p.15) to regulate the development of housing in Nicaragua is divided between central and local government, again corresponding to the enabler’s role.

However, there are significant barriers which prevent the state in Nicaragua from fulfilling the role of enabler. Although, in theory responsibility for setting norms and regulations to govern housing development rest with the state in Nicaragua, as has been explained in this section of the results and discussion there is a serious lack of uniformity from one municipality to another in the extent that planning frameworks and documents have been set. The Delphi participants reported that in some municipalities they had not been set at all and staff were unaware of how to do so. This was not the case in any of the case study cities but all 4 cities has developed a very different suite of planning documents to oversee planning. This lack of consistency means there could be no common model for the state as enabler in the different case study cities.

There are further challenges for the state as enabler. The state in Nicaragua (both locally and at central government level) has enormous problems purchasing land. This includes for any type of public focussed development including housing. This again, means that it is more difficult for the state to be a housing enabler. The issue of the state purchasing and assembling land for housing will be addressed in detail in theme 6.

Finally, the Delphi participants also revealed that the the state in Nicaragua regularly has problems attempting to negotiate agreements with private infrastructure and service providers in order to supply basic facilities to areas of housing. This is particularly the case for areas inhabited by low-income families, whether formally or informally developed. These difficulties in ensuring service and infrastructure provision for residential areas present a further barrier towards the state being an effective enabler of housing development. The area of service and infrastructure provision will be discussed in detail later in the Delphi results and discussion chapter.

6.4.5.6 The growth of low-density informal housing located on urban peripheries

As has been previously noted, levels of housing demand, particularly for low income housing in the four case study cities are extremely high. It has also been found that demand is not being met by formal planned housing developments and all four cities are experiencing large scale growth of informal settlements.

All of the Delphi participants identified that in the four case study cities there is a direct relationship between poor families' high demand for housing and the current uncontrolled growth of informal settlements on the cities' urban peripheries. In addition, some of the participants revealed that "nuclear family units" (this term was used by a number of participants) that had previously been living in crowded conditions with their extended families make up a large proportion of the people occupying plots in informal settlements. These families often find that the only feasible way of leaving their cramped conditions is to join with other families, some of whom may have recently migrated to the city from other parts of the country, to illegally occupy land on the urban periphery where they can obtain a plot of land and build a basic structure.

Delphi participants also spoke of the precarious living conditions which often result for families living in recently established informal settlements. Although the desire to secure more living space than they have had previously can be a key motivation for movement for these families, the new conditions they encounter are often highly precarious. The various threats of seasonal rains – which can easily flood any land without effective systems of storm water drainage – and eviction by the landowner mean families occupying informal settlements can find themselves homeless at any time.

In all four case study cities, many recently created informal settlements exhibit low housing densities and they are all overwhelmingly located on greenfield sites on urban peripheries. Consequently, these settlements contribute to increasing the uncontrolled urban sprawl that the cities in this study are facing and do not contribute towards growth via infill development of the significant vacant empty spaces within the existing urban areas of the case study cities. Delphi participants agreed that there is a critical requirement in all four cities for planned formal sector housing, located on appropriate sites, at appropriate densities which can sustainably meet the very high demand for low income housing.

Observation by the author, consultation of policy documents and the Delphi data show that of the case study cities Granada and Matagalpa have the largest areas of recently created informal settlements and these cities are seeing higher levels of actual informal housing development than León and Masaya. Delphi participants from all four cities had views on why this was the case. A participant from Granada said the following:

> *For Nicaragua, Granada has seen quite significant and rapid economic growth connected with the tourism and leisure sectors. People are moving to the city of Granada from other parts of the region and, in some cases, from other parts of the country. At the same time, more foreigners are buying*

> *property in central areas of the city and prices in the market have shot up. Also, land prices in Granada tend to be high in comparison to the other cities you are looking. All of this means that for lots of people the answer is to take land on the edges and build their little house there. I don't know whether we are more relaxed at stopping this kind of behavior than in other cities or not but people go for land owned by the government or the church rather than land owned by families or businesses as they are a lot more likely to be evicted very quickly.*

A participant from León, said the following:

> *Reducing informal housing growth was one of the main objectives of the León South East project. I think that has worked but in some cases, the quality of structures that people have built on their pieces of land bought formally as part of the revolving scheme have been not much better than informal housing. However, in the case of León South East the siting of the land and the plots was planned and roads and drainage etc were put in place.*

6.4.6 Theme 6: Building new houses: how is land obtained to do this?

6.4.6.1 The difficulty of obtaining land for new housing

Earlier on in the results and discussion section of this thesis, it was identified that very little formal new house building is currently taking place in any of the case study cities, either by the state or the formal private sector. The state is mainly responsible for whatever activity there is, despite being limited by the position of international creditors that the state should limit its involvement in house building.

The formal private sector is almost completely inactive in terms of house building in the case study cities, save for a very small number of ‘high-end’ projects for customers who belong to Nicaragua’s economic and social elite.

Regardless of who is building new housing - or who it is that we want to encourage to build new housing - the issue of obtaining the land on which to build housing is obviously critical. The Delphi participants all described that across the country there are currently major difficulties in obtaining land for new housing. This forms a very major barrier to residential densification and to achieving success in instituting more compact models of urban development in the case study cities. The participants described how there has been and continues to be a failure of Nicaraguan legal, political and planning systems to facilitate the supply of appropriate land for new house building by different actors in order to supply homes for families across Nicaragua’s income distribution. This section will focus on exploring the nature of this failure.

Earlier on, the role of the informal private sector (families and communities themselves, operating outside of legal mechanisms) in developing new areas of housing was also discussed. The Delphi participants agreed that it was the informal private sector which helped to meet demand for housing when the formal sector failed to do so. The participants also highlighted that because the informal private sector operated outside legal and planning frameworks it was virtually impossible for the state to steer this type of development towards meeting requirements for residential densification and more compact models of urban development, e.g. prioritising infill development and development at higher densities. All of the Delphi participants were very clear that the land supply issue is a major factor preventing the supply of housing through formal means and is a central reason for the enduring high levels of informal development.

It is not only the ability to obtain land for housing that is important but the ability to obtain it at a price that is appropriate in the context of current economic conditions in the case study cities. In addition, it is also critical to be able to obtain land in the right places to satisfy housing demand. Otherwise, house building will not be financially viable and it will not be capable of providing accommodation that is affordable for those that need it. A further reason why the ability to obtain land in appropriate places is critical is that only housing development that takes place on strategically planned sites will facilitate infill development and contribute towards the goal of achieving more compact forms.

As was discussed earlier, despite the international movement for structural adjustment affecting house building in Nicaragua it is still mainly the state - often working with non-private partners - which is building the extremely limited amounts of new housing in the case study cities - particularly when housing for the majority is concerned rather than for the minority of economic and social elite. State housebuilding has decreased significantly since 1990 in Nicaragua, but the formal private sector has mostly failed to step in to build housing for the majority of the country’s income sectors. Consequently, for practical purposes in this section it is mainly the barriers which obstruct the state and its partners from obtaining land for new housing which are considered. It is more difficult to identify the barriers to the formal sector developing housing when so little of it seems to be being attempted. It is also the case that the Delphi participants were able to offer a more in depth analysis of the issue of the state obtaining land rather than the private sector. The majority of the participants work for local government in the case study cities and the minority of participants who work in academia do so in state run universities and have substantial professional and personal contact with Nicaraguan local government and its staff. In addition, the Delphi participants painted a picture of land negotiations in Nicaragua still generally being non-transparent and difficult to obtain information about. This was the case when the state negotiated to buy land from private landowners as well as exclusively between private actors. However, the participants described how this lack of transparency was far more extreme when all of the actors were private and it was often the case that even having the opportunity to enter into discussions about land was dependent of a person or family's social and political standing. For all of these reasons, this section will mainly focus on land purchasing for new housing when one of the actors involved is the state.

Earlier on, it was also discussed to what extent the current role of the Nicaraguan state in developing new housing corresponded to the role of 'housing enabler' as defined by Stein and Vance (2008, p.15). Being a 'housing enabler' can be seen as a type of 'positive compromise' position for the state to adopt, somewhere between the pre-structural adjustment tradition of the state as house builder and the minimal role for the state advocated by supporters of the free market approach to house building. The role of housing enabler has been put forward in literature on housing in developing countries as a positive role for the state to adopt considering current international political and funding realities facing governments. Stein and Vance (2008, p.15) describe an enabler's primary duties as establishing a framework of norms and regulations, putting in place funding for land purchasing and organising core infrastructure and services. Earlier on in the results and discussion part of this thesis, it was concluded from the Delphi participants' responses that in the 4 case study cities the state even faced enormous challenges in terms of its ability to fulfill the role of housing enabler. A major challenge were the enormous problems the state (both locally and at central government level) faced in organising and funding the purchasing of land to support the formal public or private sector to develop new housing.

6.4.6.2 Virtually all state activity in obtaining land for new housing is at the local level

The Delphi participants highlighted that for the vast majority of the new housing developments in which the state had been involved in recent years in the 4 case study cities, it was local government and not central government/(INVUR - the central government agency for housing) that had worked to obtain the land required. In fact, the majority of the participants also identified that central government provide no or almost no support, leadership, guidance or resources to local government for the purposes of obtaining land for housing development. Most of the participants said explicitly that they and their colleagues thought that municipalities in Nicaragua would benefit from a greatly increased commitment from central government in this sense. However, none of those that said this thought there was even the most remote chance of it happening in the short or medium term. The lack of commitment from central government and the lack of coordination between central and local government in this is a major barrier to the development of new housing in the case study cities and also to residential densification and the pursuit of a more compact model and land efficient model of urban development.

The Delphi participants made an additional point about land assembly for the development of new housing in Nicaragua. They identified that in many of the cases of new housing development to take place since 1990, it was international cooperation organisations working with local government which had provided the financial capital to purchase the land. Sometimes these cooperation organisations provided funding as part of a model whereby payments from families occupying lots/houses returned the cost of purchasing the land to the project fund. The largest group of international cooperation organisations involved are those set up as part of city-to-city cooperation networks between the local authorities and/or civil society in Nicaraguan cities and in cities in developed countries. The most renowned example of this type of local level cooperation in Nicaragua is the relationship between Dutch and Nicaraguan cities. All four of the cities studied in this thesis have a partnership with a Dutch city (though in practice Granada's involvement with the city of Dordrecht has been inactive for a number of years and Matagalpa's relationship with its twin city has been less productive than the relationships active in León and Masaya). León's relationship with Utrecht has been by far the most active in terms of land assembly for low income housing development.

6.4.6.3 An inactive land market and specific difficulties faced by the state in land negotiations

Many of the Delphi participants explained in detail and exasperatedly how the purchasing of land by the state for new housing was an extremely difficult thing to achieve. According to the participants, the state faced particular difficulties purchasing land at a reasonable price - their justification of a 'reasonable price' rested on the realities of local economic conditions. In addition, obtaining land for the purposes of building housing for low-income families was also especially challenging.

The Delphi participants reported that the land market is relatively static and inactive in Nicaragua and there is a culture of landowners ‘sitting on their land’ even if the land is not in use. Landowners often set unrealistically high asking prices and frequently raise them further when they discover that the local municipal government is involved in the negotiations, the landowners believing that government has the resources to pay a higher price. In some cases, landowners are completely opposed to selling land to be used for low income housing projects because of an uninformed belief that such schemes will always offer them less financial benefit than if they sold the land or developed it themselves for other uses including for middle and high income housing. Delphi participants explained that there does exist legislation created by central government (such as that giving local authorities compulsory purchase powers which will be discussed in more detail in a later theme as part of this results and discussion section) to empower local authorities in land negotiations for projects to further the public good. However, the legislation cannot be put to use because it is associated with the Nicaragua’s 1980s revolution and the country’s political divisions which occurred at that time.

For example, in Granada in the early part of the first decade of the 21st century, the local authority failed completely in its repeated attempts to purchase land for a mixed income housing development in the north east of the city. The scheme was master planned in great detail by the Granada-Dordrecht city-to-city cooperation partnership who were careful to plan housing of different types and residential densities so as to maximise choice for residents as well as to optimise land efficiency. The scheme was eventually stopped completely because it was impossible to obtain land, meaning the large amounts of resources deployed in the planning of the scheme were wasted. The demise of this project is an example of a progressive housing scheme which was considerate of density issues, brought to an end because local government lacked the means to conduct land purchase negotiations with authority. The experience also demonstrates the need for better project management - as the issue of land seems to have been addressed only after detailed plans for the housing project had already been drawn up.

With respect to opportunities for house building by the formal private sector, due to the poorly developed housing market in Nicaragua and the fact that there is very little tradition of private sector investment in housebuilding, land owned privately within cities or just outside them is unlikely to be developed privately for housing. In many cases, land is simply left vacant in the hope that its financial value will increase at some unspecified time in the future. Rather than being a proactive investment calculation this is more of a passive ‘wait for better times’ entailing what are likely to be unrealistic expectations of possible future land values. A respondent from Matagalpa said the following in relation to this:

> *The private landowners in this city, who between them own all of these vacant plots you see around, both in the centre and in the suburbs don’t want to sell. They don’t want to sell and they don’t want to develop. They are just waiting for something better to come along.*

Very little vacant land is owned by the state in Nicaragua, including in and around cities. In addition, there seems to be a view, widespread among private landowners, that the government is ‘fair game’ to be taken advantage of in land negotiations. Landowners consistently make demands for a sale price/compensation levels that the Delphi participants consider unreasonably high and which are evidently far in excess of what can be deemed ‘the going rate’ for such land. The respondent from Matagalpa mentioned in the previous paragraph also said the following about the expectations of the owners of private vacant land in the city:

> *They are also waiting for the council to give them an offer. But they won’t accept anything reasonable. The sum of money would have to be extraordinary for them to say yes.*

6.4.6.4 Servicing the land

Delphi participants also highlighted that if attempts by the state to purchase land for new housing were successful, it was also often very challenging to convince private utility companies providing services like electricity and telephone infrastructure to commit to undertaking the necessary works to supply the new residential area. Getting such guarantees is particularly difficult for low income housing as there remains a perception among private utility companies that it is unprofitable to make significant investment to supply poor houses with services.

6.4.6.5 Obtaining land in the right places in order to move towards more compact forms of urban development

All of the Delphi participants revealed that there continue to be very many empty plots of significant size in and around the case study cities. In terms of the effect on built form and overall density within the cities it is the large numbers of such plots in the ‘established urban area‘ of the cities which is of great concern. For the reasons described above in this theme these plots are not being developed and are being left vacant. This creates a situation in urban areas where the informal sector which is providing housing in the absence of adequate provision by the formal sector employs leapfrog development, thus contributing to the sprawling and haphazard nature of urban development in Nicaraguan cities. Some of the Delphi participants also said that they believed that for formal development of housing, business or commercial facilities and amenities it was easier to obtain land on the urban periphery or even on the 'rural side' of the existing urban-rural boundary, than on the vacant plots in the existing urban area. According to them, there tended to be more complications with disputed ownership with the vacant plots in the existing urban areas. As well as this, the owners of these plots often had a higher estimation of the financial value of the land than is the case with land on or outside the urban periphery. Nevertheless, as has been made clear this is not to say that the land sale prices sought by owners of land on or outside the urban periphery are not also highly unrealistic and prohibitive for development.

It is interesting to consider that the fact that it is precisely those plots within the 'established urban area' of the case study cities where the sale price sought by the land owners is often highest possibly means that the landowners have some concept of the elevated value of these sites and their location within the existing urban fabric of the cities. However, under present conditions it is extremely challenging to capture the potential of these locations by converting them into the site of useful urban functions. Sites in accessible urban locations could contribute very significantly towards cities following a more compact and sustainable direction of urban development. Furthermore, it has been the author's observation throughout the time that the research was conducted that on plots in the urban periphery or outside the urban-rural boundary planners, developers and residents are particularly likely to exhibit very little regard for developing the land in a ‘space efficient’ manner. It is interesting to wonder whether the peripheral location of these plots endows them with a sense of space and relative isolation that discourages those using from thinking of efficient development of the space as a central consideration.

If vacant plots within urban areas were fulfilling an informal function as areas of open green space for urban inhabitants they would be of some benefit to the cities in their current state. However, during the entire period spent by the author conducting Delphi data collection, collecting housing density calculations or making other observations, not a single example was found of one of these privately owned plots having a recognised beneficial leisure role - or any other constructive role - for the local community. In fact, the Delphi participants, as well as local residents that the author discussed these issues with, consistently indicated that these plots were a problem for local communities. The land within the plots was often not well maintained and once overgrown often became a source of rats, scorpions and snakes who then encroached upon surrounding dwellings, endangering their inhabitants. In some areas such plots provided a cover for illicit activities such as drug taking and were a place where prostitutes took their clients. A respondent from Granada stated the following about the fact that vacant privately owned plots abounded within the city:

> *In my experience of these plots, the vacant ones, that are in private hands, well, they can be a source of all sorts of problems for the people that live in the surrounding area. I know that in rich countries around the*

> *world parks and gardens in cities are a marvellous thing and I'm not saying that that would be a bad thing here but these disorganised little plots of empty land are places where drug addicts go, people get robbed there and at night people are scared of the places. Nobody looks after them and it is impossible to do so because somebody else owns the land.*

The author recognises the justified and coherent argument in literature in support of small green spaces which are less formal than municipal parks operating in urban areas. However, the success of enterprises such as these is contingent on there being the political and community will to maintain such spaces, on land ownership issues permitting them to be cared for and on there being the resources to do so. Such spaces can provide local inhabitants with cherished spaces and can make higher-density living more desirable and sustainable. However, the evidence from this study shows that at present in the case study cities this is not the case.

The fact that the state does not own a large amount of land in and around Nicaraguan cities restricts the impact it can have in determining aspects of urban land use planning including whether cities are developed at higher densities and how non-developed areas of land are used. In the case study cities, privately owned plots are left vacant by their owners, many of whom it seems wait interminably for the dream of a drastically increased sale price. While these plots sit there unused they become a nuisance for the community and fail to have their full value realised as highly accessible urban sites.

Observations by the author, consultation of policy documents and the Delphi data suggest that, of the case study cities, it is Matagalpa which demonstrates the most efficient use of land within ‘the established urban area’ and is the city with the lowest number and total area of unused plots. One Delphi participant from Matagalpa made the following observation:

> *Your four case study cities, Matagalpa is the one that is most size restricted by its topography – it is in a fairly narrow valley. I suppose over generations that has been something that influenced the built form of the city. That is not say that we don’t have private owners of plots leaving them empty and holding out for unrealistic prices – like the other cities. However, maybe in Matagalpa we have the greatest impulse and greatest need to get the land deals done to permit building on empty plots. Maybe in Mataglapa it is more likely to happen because it has to. Maybe the other cities are only starting to realize that they have to.*

One specific part of ‘the established urban area’ where land is used in an inefficient manner is the centre of residential housing blocks where there is open space at the rear of individual residential plots and there exists an odd unused or underused zone of space whose ownership seems to lie in a sort of grey between the rights of the individual plot holders and the sense of the space being shared between all those who reside in the block. León has the most extreme examples of this phenomenon in enormous historic colonial style blocks on the periphery of the city’s historic centre. The land in question is not used for any purpose and lies at the end of private plots of open space that already extend significant distances from the rear of the housing structures. In León and Matagalpa there are examples of infill development which have occupied these zones of space with the creation of residential units in the centre of the existing residential blocks. This clearly includes accessways for the ‘interior housing’ which pierce the perimeter of the original block at a single point.

6.4.6.6 The unwillingness/inability of Nicaraguan government to use existing compulsory purchase powers to obtain land for new housing

According to the responses from the Delphi participants, a factor which contributes to the impotence of government in determining aspects of urban land use planning is the highly controversial nature of compulsory purchase legislation in Nicaragua. As a result of the controversy surrounding it, the government is almost always unwilling to use such legislation despite it being on the statute books. This situation makes it extremely challenging for regulatory planning authorities to influence the nature of urban development on the urban periphery where urban sprawl is a particular problem and in existing urban areas where land continues to be used extremely inefficiently.

The Delphi participants explained that the concept of the state (manifested by central or local government) obtaining land from a private landowner against that landowner’s will is a touchstone subject within Nicaraguan society. The fact that compulsory purchase legislation exists and is used across the world by democratically elected governments as part of coherent arrangements for effective urban planning does not seem to influence thinking on this subject within Nicaragua. For many of those opposed to the practice of compulsory purchase the fact that it is a legal device enshrined in Nicaraguan national legislation - and if done correctly involves the proper compensation of the landowner - seems to make little difference. The opposition seemingly continue to equate compulsory purchase with the expropriation of private land without compensation, with dubious legal justification and with the pursuit of private personal gain by groups working with the powers of the state. Many of those who oppose the contemporary use of compulsory purchase legislation consider that violations of civil rights such as these took place in Nicaragua during the 1980s. In Nicaragua, feelings about events in the 1980s continue to overlap with the approach to dealing with the present.

The Delphi participants revealed that the opposition to compulsory purchase described above is one piece of the much larger issue in Nicaraguan society of extreme political polarisation. The political traditions of ‘El Sandinismo’ and ‘El Liberalismo’ pervade all aspects of society with a sense of division and mistrust. El Sandinismo is based around the ‘cult’ of the Sandinista political party in Nicaragua and the memory of the revolutionary government they formed during the 1980s. El Liberalismo is based around similar levels of faithful commitment to the Liberal political party and the historical view that the transition of the Somoza family dictatorship into the Revolution and Sandinista political dominance was disastrous for Nicaragua.

Elected members within local government have consistently shown themselves to be extremely reluctant to consider compulsory purchase an option for obtaining land for housing or any other use. The Delphi participants in this study generally consider there to be 3 possible reasons for this. First of all, some elected members are or were themselves landowners or are closely connected socially or through family to landowners or former landowners and therefore have a vested interest in preventing the use of compulsory purchase legislation. Secondly, elected members feel under pressure from powerful families locally (possibly some of whom are also councillors) to not be seen to be supportive in any way towards the possibility of using compulsory purchase. Finally, elected members' ideological and/or political views and affiliations, possibly developed through their own or their families experience of history, can make them resistant to the idea of compulsory purchase. It is of course possible that for any particular councillor this final reason merges with the first two reasons.

The Delphi participants in this study spoke frequently of how the decision making of elected bodies within local government in Nicaragua was repeatedly subject to outside influence. Powerful families representing local landowning interests are able to ensure that discussion regarding the possible use of compulsory purchase legislation is shut down.

Without the support of 'the politicians' (as the elected members in local government are often referred to in Nicaragua) and in an atmosphere where talk of compulsory purchase is only 'the stuff of hushed talk in dark corners of municipal buildings,' 'the technicians' (civil servants working on areas such as urban planning, housing and infrastructure etc) are not empowered to consider compulsory purchase a viable option.

A Delphi participants from Granada identified that:

> *Nobody around here wants to talk about expropriation of private land. Of course not. People associate that with the Revolution and the decade of the 80s when this country was at war.*

This participant showed themselves to be overall fairly sympathetic to the need for some sort of compulsory purchase capacity for government. However, it is interesting to note that despite this, in the quote above, the participant refers to ‘expropriation’ rather than using a term which carries with it more of a sense of equity, fair treatment, compensation and legal grounding.

Throughout the time that the author has spent in Nicaragua the only case that can be identified of compulsory purchase legislation being put into practice since the Sandinistas lost power in 1990 was in the redevelopment of an urban area in Managua known as La Chureca. This was a long running project which began in the early part of the last decade and was led by ‘La Cooperación Española‘ - the Spanish government’s overseas development organisation. The organisation had a large amount of time, effort, and money invested in the project and there was a sense from some of the Delphi participants that their reputation as an organisation capable of achieving successful outcomes in Nicaragua depended partly on the outcome of the project. Crucially, the organisation was also able to exploit its distance from the ‘power politics‘ of Nicaraguan central and local government and its relative freedom from influence by powerful socio-economic forces in Nicaraguan society to the advantage of the project and the attempts to secure the land. Some Delphi participants also explained how, in their view, ‘La Cooperación Española’ in setting the development up as a ‘landmark cooperation project’ in Nicaragua, had made their continued cooperation with Managua’s local government contingent on the council’s ability to secure the La Chureca land for development. One Delphi participant from Masaya said from experience about the role of ‘La Cooperación Española‘ that:

> *They said to Managua council that they would not work with them in the future if they could not sort out the issue of the land at La Chureca …*

> *the land belonged to one of the old families in the area … I think Managua council only did it because they felt forced to. They had no other option.*

6.4.7 Theme 7: Variation of density in new housing developments when the state assembles land and plans plot layout and individual occupants build dwelling structures

Where the state has been able to obtain land for the purposes of new housing developments, often working with and/or funded by international cooperation organisations, a common development model is for the state to be responsible for planning plot dimensions and layout and for individual occupant families to be responsible for building their dwelling structures. The Delphi participants described this process whereby the land is obtained formally and is sub-divided into plots for individual dwellings as part of a formal site design process. This has been done in at least one case in all of the case study cities since 1990 by local authorities working with international cooperation initiatives. The highest profile example of this in Nicaragua that has produced the greatest number of homes is the León South East urban extension.

According to the Delphi participants, a barrier to residential densification and to developing compact residential form is that this form of development leaves a lot of effective control over density outside of the state's control. The participants acknowledged that under the model, state planning authorities have substantial influence over the layout and density of plot layout, but not over what type of structures end up on the land. ‘Type of structure’ can be taken to include: the number of storeys in a dwelling structure, or the proportion of a plot which is occupied by dwelling structures as opposed to outside/open space. If the housing itself is built by the owner occupiers some control over density is ceded by the state and it may not be possible to regulate density in any coherent way if having to work with every individual family house builder. Even in different development sites/situations where plot layout was the same, different types of construction by families could result in different density outcomes. For example, different families may build on different numbers of storeys, they may occupy different portions of plots with dwelling structures and they may sub-divide plots so that more than one dwelling structure is built on a single plot, with buildings or rooms being rented or sold to other families including members of the same extended families. All of these myriad options very significantly affects eventual housing density.

The León South East urban extension is, by a significant margin, the largest of this type of housing development found in the case study cities. In some parts of the León South East development whole blocks were built by means of a cooperative effort of groups of residents and non-governmental organisations offering technical assistance and direction. In these cases a standard model was used for all houses in the block so that dimensions of housing structure and outside space were equal and density uniform across the block. In most parts of the León South East development individual families built their own homes on plots marked out by the state planning authorities. Here, individual plots are used in different ways creating a diversity of urban form and density throughout the site.

The author attended a conference on the planning and development of urban extension areas organized by the León municipal government and aimed at different Nicaraguan cities sharing good practice. Some of the Delphi participants attended. The conference involved a tour of the León South East site. During the tour a Delphi participant from Masaya made the following observation:

> *It's almost as if León South East is made up of a number of different villages that look and feel quite different from each other. You don't get the sense of the area being a coherent whole. There are concentrations of houses and then a very large space and then another concentration of houses. That each concentration or village is different from each other is partly due to one village being nearer the main road, or one being nearer the football pitch, or another being close to a clump of trees but it's also partly due to the different ways in which the houses have been built. In some villages neighbouring structures are closer to each other, in one village there are more two-storey dwellings than in any other part of the site and in another village plots seem to have encroached upon the street more than in other areas.*

6.4.8 Theme 8: Making alterations to existing residential plots and dwelling structures

6.4.8.1 The sub-division of existing residential plots

The Capetown, South Africa densification strategy was discussed in an earlier chapter. Part of what the document does is to outline an extremely ambitious policy drive towards achieving the sub-division of existing urban residential plots. The stated overall aim in Capetown of employing this method of residential densification and others is to radically increase average housing densities across the Capetown urban area, combat rampant low-density urban sprawl and reinvent the city as an example of well planned compact urban living. The sub-division of existing urban residential plots was in the possible list of methods of residential densification identified by the Delphi participants which appeared earlier on in the thesis. However, the methods was only identified by 2 out of 17 of the participants. The participants are all urban development professionals and are immersed professionally in the areas of planning and housing in the case study cities. The fact that relatively few of them identified this method is itself a barrier towards its implementation in the case study cities, meaning that perhaps currently there is relatively little awareness or support for this option - even among planning/housing professionals.

The sub-division of existing urban residential plots involves separating the space occupied by an original plot to produce one or more additional plots which can then be rented, sold or simply used by another party for residential purposes. Plot sub-division only involves the re-organisation of land/space in a plot as opposed to the re-organisation of how a dwelling structure is used as is the case with some other methods of residential densification. Existing residential plots that undergo sub-division can be empty of structures - in which case they have been developed to have or have been assigned a residential purpose but are not currently developed - or can have structures on - in which case it is the open space around the structure which is sub-divided.

In this section the barriers to the sub-division of existing urban residential plots are explored according to the data collected from the participants through the Delphi process.

The Capetown densification strategy mentioned above addresses some of the factors which can stimulate the sub-division of existing urban residential plots.

Chief among these is whether or not any significant financial incentive exists for the owners of residential plots in existing urban areas to sub-divide them. Such an incentive would be the carrot in the the traditional carrot and stick analogy. Earlier on in this results and discussion section of the thesis, the issue of Nicaragua's inactive land market was identified. The land market is structurally ineffective and this means that opportunities for people to buy, sell or rent land including residential plots are relatively few and far between. Without a structural overhaul, possibly coupled with some sort of financial stimulus, the problems with the country's land market, which are felt in all of the 4 case study cities mean that there is no particularly powerful financial incentive for owners to sub-divide existing urban residential plots.

The policy approach outlined in the Capetown densification strategy rested more on incentivising the sub-division of plots rather than introducing legal obligations to do so, or financial penalties for not doing so. However, in the case study cities because of the problems described in the previous paragraph financial incentives for sub-division are not readily available. The 'stick' approaches of legal obligations or financial penalties could be considered but without much chance of there being accompanying financial incentives, such policies may be seen by the public as authoritarian and heavy handed. The most appropriate way of using legislation and a system of financial penalties could be to apply them only to plots on which there are no dwelling structures at all or where there are particularly large amounts of unused land. This could obviously run the risk of becoming fraught with conflicting definitions of what exactly constitutes 'unused' or how large an area of unused land qualifies to be subject to legislation or financial penalties. In addition, a major barrier in the case study cities towards effective application of any legislation or policy continues to be the difficulties with governance and policy implementation outlined in detail earlier in the results and discussion. For example, there is enormous variation in the planning frameworks which govern urban development from one municipality to another in practice. If legislation and financial penalties to promote plot sub-division were instituted for application in different municipalities they could interact with existing the different planning frameworks found in each of those municipalities in different, and possibly unexpected, ways.

Based on what was said by the Delphi participants, a possible way of incentivising owners of plots in Nicaragua to sub-divide could be to promote sub-division for the purpose of creating new plots that members of the owner's extended family could occupy. The population of Nicaragua's secondary cities - including for all of the case study cities - is increasing rapidly. In addition, there are signs that in Nicaragua's urban areas, the newest family units, i.e. young adults with children, are increasingly determined to live in their own dwellings as opposed to living in the often overcrowded conditions of the traditional home shared with the entire extended family. As a result, there are currently unprecedented levels of demand for housing in Nicaragua's secondary cities. In an earlier chapter, data was examined which illustrates this situation and it was clearly evident that housing demand was at a critical level in the 4 case study cities. For the patriarchs and matriarchs of extended families across Nicaragua who own housing plots within the existing urban areas of cities this situation means that increasingly, members of the younger generation of their families are moving away from the family hub - often to inhabit plots in precarious conditions on the urban peripheries. According to the Delphi participants, the opening of these spatial divisions within the family is generally not something that the patriarchs and matriarchs in question are particularly happy about. Promoting the sub-division of existing urban residential plots as a way of striking the balance between keeping extended families together and giving the younger generation of new nuclear family units some of the freedom and independence they they crave could be a successful strategy. If sub-division did take place it would work towards reducing overcrowding in the homes of extended families as unused space in a plot could be used to create new housing plots. In addition, sub-division would help to reduce urban sprawl created by the growth of low density informal settlements on the urban periphery which are the places new nuclear family units go to, seeking to escape the overcrowding of the traditional shared home of the extended family. Promoting the sub-division of existing urban residential plots in this way could involve making the owners of plots more aware of the options for plot sub-division or could involve the provision of financial, legal and planning support for the owners of plots wanting to sub-divide.

On paper, a major barrier to the sub-division of existing urban residential plots are the NTON minimum norms for the dimensions of housing developments. The NTON suite of documents produced nationally in Nicaragua were discussed in detail earlier on in the results and discussion section. Of particular interest for this part of the discussion is the NTON text which outlines a national minimum distance between neighbouring detached homes. Many of the Delphi participants believed this minimum distance to be overly generous and stated that if observed ‘to the letter’ it results in land being developed for housing in an inefficient way. If observed, this legislation would make the sub-division of existing urban residential plots less effective as a tool of residential densification as it would reduce the area within plots created by subdivision that could be used for dwelling structures. In some cases, plot subdivision would be non-viable as the space left within a new plot after the minimum distance had been observed would be inadequate for building a home. However, the Delphi participants that spoke about the NTON minimum distance requirement all observed that in practice it was generally only applied to new housing planned and developed as part of a housing development containing multiple homes. As a result, it seems that in this case, the lack of rigour and consistency in the case study cities and across Nicaragua concerning implementation of policy, plans, legislation and guidance is actually advantageous as regards the opportunity for residential densification.

All of the participants, at at least one point during their input into the Delphi process, spoke about there being an established concept of a defined minimum size for housing plots across the country. Obviously, such a concept if actually influencing urban development in practice would limit the potential for sub-division of existing urban residential plots to be used as a method for residential densification. However, different participants gave different figures for this minimum size and the figures rarely corresponded. A small number of participants even gave different figures for the minimum size at different times during the Delphi process, apparently unaware that they were contradicting themselves. Despite being asked directly none of the participants were able to identify the specific document(s) containing the figure for the defined minimum size for housing plots across the country. Indeed, despite the fact that the author has obtained as many Nicaraguan national and local planning/housing related documents as possible, including those covering all 4 of the case study cities, and has analysed each one in detail, it has never been possible to find a defined minimum size for housing plots across the country.

Although there does not seem to be a single agreed specific figure for the minimum size of housing plots nationally or in any of the case study cities, the Delphi participants identified that nationally, among the public and urban development professionals alike, the idea that Nicaraguan families deserved relatively large residential plots was widely recognised and widely subscribed to. Most of the Delphi participants described this idea but did not agree with it themselves as they thought it was creating an enduring situation of low-density urban sprawl which was not good for the country's urban areas. A small number of the Delphi participants gave the impression that they understood all of the 'sustainability' arguments for smaller plots and found them credible but couldn't quite bring themselves to accept that the idea could work in Nicaragua, even in central urban areas. This was because of the social and political attitudes to density which had developed in Nicaragua.

In summary, the concept of a defined minimum size for housing plots across Nicaragua, despite appearing not to exist in written form or with specific figures for size given, still influences how plot subdivision and plot size are seen in Nicaragua. The state of affairs does constitute a barrier to residential densification, albeit in a rather vague way.

6.4.8.2 The phenomenon of large extremely underoccupied historic colonial properties in the heart of cities. Lack of imagination and ambition in developing residential densification opportunities in the historic cores of cities

Most of the Delphi participants identified the huge underused potential for residential densification in the existing historic cores of the cities in which they worked. The only one of the case study cities where there the Delphi participants reported that there had been significant residential densification in the historic core was Matagalpa, where the Delphi participants suggested that space restrictions imposed by its location in a steep sided valley have affected the psychology of development.

One of the possible methods of residential densification - identified by the participants and described in an earlier section of the results and discussion - which was discussed repeatedly by the participants regarding the historic cores of the cities was that of possible sub-division of existing historic structures into multiple dwellings. The participants reported that in all of the cities, but particularly in Granada and León, there were very large single storey historic colonial properties located centrally comprising single dwellings which were very significantly under-occupied. As was discussed earlier on, participants had suggested that owners of vacant plots or vacant areas of plots could be incentivised to sub-divide them thus creating new plots that could be sold or rented or used to accommodate separate nuclear families within the original owner's extended family. In a similar way, participants also suggested that owners could be incentivised to sub-divide very large under-occupied structures to create new separate dwellings.

Major barriers to this possible method of residential densification include some of the same as those identified for the sub-division of existing plots. In particular, Nicaragua's relatively inactive residential property market is a problem in terms of providing a financial incentive for owner's subdivisions. That is of course not to say that there is not demand, rather that the property market as it is does not provide a functioning mechanism for meeting demand. However, the incentive of providing members of extended families with their own dwellings through this approach may be viable. This would hopefully provide an alternative to members of extended families having to occupy informal plots and structures on the urban peripheries in order to secure some space of their own.

Another possible barrier discussed by the participants to the sub-division of existing structures are the minimum requirements for housing imposed by the NTON national legislation. Of particular interest here are the requirements for minimum distances to exist between neighbouring dwelling structures. However, as was identified earlier, the NTON regulations appear to be fairly unrigorously put into practice generally and the Delphi participants made clear that where they were put into practice the main focus of such regulations as they were currently interpreted were new housing developments rather than conversions of existing ones.

Finally, a major barrier to the sub-division of existing historic properties is a lack of existing examples of sub-division and conversion demonstrating innovative and imaginative design. Thoughtful and creative schemes are required. For example, including how to use internal courtyards as successful semi-private shared spaces when converting large single properties to form multiple dwellings.

Of the case study cities, Granada and León have the oldest and largest historic colonial style dwellings. Delphi participants confirmed that, when founded the two cities had particular crucial strategic positions for the Spanish and construction of large and opulent buildings reflected their importance. Nowadays, Granada and León possess far larger numbers than Masaya and Matagalpa of historic colonial homes with very large floor space area. In addition, Granada has even more examples than León of colonial homes which still possess the full extent, or close to the full extent, of floorspace with which they were originally built. A participant from Granada described the situation in their city:

> *Central areas of Granada have an abundance of colonial properties with very very large floor areas. There are more properties in this city than any of the others you are looking at where the floor area has not changed significantly from the time they were built. However, I'd say probably for the first time in their history a number of these properties now have only 2 or 3 residents. These properties are really really big. Why are there small numbers of people living there? Well, sons and daughters have emigrated abroad or just to Managua and have brought up their own children there. Often the elderly grandparents are the only ones that remain in these large properties.*

6.4.9 Theme 9: Expertise and resources in earthquake resistant house building

Around the world, in numerous economically developed and developing countries, the technology and expertise exists to plan and build earthquake resistant housing on more than a single storey. In fact, in a number of countries that are susceptible to major earthquakes - and which certainly are not among the wealthiest in the world - for example in states in North Africa and in Turkey, multi-storey housing has been seen as the most affordable way of building pro-poor earthquake resistant housing. It is of course also the case that in regions that are amongst the world's richest, such as in California in the US and in Japan the capability exists not only to build very tall earthquake resistant buildings, but also to explore and push the limits of earthquake resistant architectural form.

This section of the results and discussion section focusses on the area of expertise and resources in earthquake resistant house building in Pacific urban Nicaragua and in the case study cities. That sufficient expertise and resources are unavailable or are unable to be deployed is clearly a barrier to residential densification itself. Clearly, the ability to achieve residential densification by building new housing or updating existing housing by building upwards is affected. This section will also probe the deeper aspects of the barriers - the reasons why earthquake resistant house building on more than a single storey does not happen.

6.4.9.1 The distribution of housing of more than a single storey in urban areas of Pacific Nicaragua

From the Delphi data in this study as well as from observations of Nicaraguan cities made by the author it is clear that in the country's urban areas there are comparatively few housing structures which have more than a single storey. In addition, almost no housing structures have a cellar/basement. Interestingly, this is the case across the range of Nicaragua's different urban housing types which cover the breadth of age of properties and income levels of occupants.

In Nicaraguan cities there is the occasional dwelling which has two-storeys (almost never more than two) which is normally the result of the upward extension of an original single storey dwelling. However, sites where multiple buildings of more than a single storey are found together are extremely rare. The Delphi participants were able to identify the few rare examples that they were aware of. It should be noted that these examples are not limited to the case study cities only. As the number of examples is so few it was thought appropriate to list all of them here. They are as follows:

- a very small number of multi-dwelling housing blocks on 3 or 4 storeys built during the 1980s by national or local government and occupied by low-income families. The examples across Pacific Nicaragua that the participants were aware of were the 6 x ‘FUNDECI’ 3-storey blocks in León, the 2 x 4-storey ‘Cancha de la Brigadista’ blocks in Matagalpa, the 8 x 4-storey blocks in Reparto San Antonio in Managua and the 3 x 4-storey blocks in the neighbourhood of Sajonia, close to La Lagauna de Tiscapa in Managua (all 3 have since been demolished)
- an extremely small number of multi-dwelling apartment blocks restricted to a small area of central Managua and developed in 2009/2010 by private housing developers and marketed - and priced - for a high-income market

The Delphi participants were all of the opinion that the small number of examples of multi-dwelling structures indicated above had been constructed using a reasonable standard of earthquake resistant construction. On the other hand, they were concerned that a large proportion of the single dwelling structures with more than a single storey which were dispersed in the urban areas of Pacific Nicaragua were built with no or very little earthquake protection.

6.4.9.2 The lack of current earthquake resistant house building on more than a single storey

The very small amounts of earthquake resistant housing on more than a single storey found in urban Nicaragua is obviously a major weakness for the country as far as working towards more compact cities and residential densification is concerned. Whether it is because of inability or unwillingness it is certainly a barrier towards residential densification in the case study cities. On the other hand, it is also clearly an enormous weakness as regards safety if housing is built on more than a single storey without adequate earthquake protection.

If housing structures of more than a single storey were more widespread, the size of plot required for providing adequate internal living space for an average sized family or even for multiple families would obviously be very significantly smaller. In fact, it may be that if Nicaraguan housing was effectively released from the restriction of being limited to a single storey, the overall floor area of an average family house would increase with the flexibility and greater capacity that building on more than a single storey can bring. This is not certain, but after all, in any urban location land is the most finite of all the resources required to build a house!

6.4.9.3 The effect of reduced house building by the state on the ability to build housing on more than a single storey

As was discussed earlier in the results and discussion section, the Delphi participants described how from the 1990s onwards the nature of international policy has created a reduction in Nicaragua in the involvement of the state in housing development and construction. The dwelling structures on 3 or 4 storeys built by Nicaraguan government in some of the country’s cities in the 1980s now form a large proportion of the total amount of housing with more than one storey across the country’s urban areas.

After the reduction in the 1990s of the Nicaraguan government’s involvement in house building and housing development and in the light of the failure of the formal private sector to ‘step in’ and take over the mantle of house builder/housing developer, it is now often left to Nicaragua’s families to self-build in order to provide housing. Examples of self-build range from groups of people who illegally occupy land on which they build precarious structures to the family who legally occupy a large historic colonial style property in a central area of one of the case study cities and who make alterations to the building to provide sub-divided living space, perhaps including for a son or daughter with children who desire some private space. Even in the development of the León South East urban extension over recent years - which is an example of state involvement in housing development with the support of an international cooperation network - the dwellings themselves were built by the families that went on to occupy them. Because all of the families occupying the vacant plots on offer in León South East have been in essentially the same position many have formed cooperative working groups for the purposes of housebuilding. Even in these conditions, where families are supported to self build, people have not built on more than a single storey. Building dwellings on any more than a single storey is even less likely to happen for the majority of families who self build who are unsupported by a cooperative or a similar framework.

Families who self build simply do not have the technical awareness, experience or resources to plan or construct, using earthquake resistant engineering, the foundations necessary to support a building of more than a single storey (or one which could have an additional storey added to it in the future). Families’ lack of technical awareness, experience or resources is equally an issue for building the supportive columns and beams, using appropriate materials, which are involved in making a building resistant to seismic activity and which would need to be installed within a single storey structure if a second storey were then safely to be added at a later date. Given relevant training, support and access to resources all of the above is possible for families who self build. It has been done successfully and affordably around the world, though effective support frameworks are necessary in order to do this.

6.4.9.4 Housing finance and the ability of families to construct earthquake resistant self build housing

Above, it was explained that sufficient technical awareness, experience and/or resources were required for families to to plan and/or construct self build dwellings that are earthquake resistant. A number of the Delphi participants explained that a crucial addendum to this is that adequate finance must be available for families to make the up-front expenditure necessary to install the foundations, columns and beams to make a 2-storey (or higher) building resistant to seismic activity - or make the later construction of additional storeys safe. For example, if a single storey building is constructed and the option to extend upwards in an earthquake resistant manner in the future is to be left open, then the foundations and walls of the structure will incur a higher up-front cost. According to the Delphi participants, almost all existing single storey dwelling structures in the case study cities have no, or very few foundations, columns or beams for earthquake resistance meaning they would have to undergo a very large amount of retrofitting if they were to be able to provide a base for the construction of additional storeys in a safe manner as regards the possibility of seismic activity. Worryingly, the participants also made clear that they believed a very large proportion of self-build housing on 2-storeys in the case study cities - which could have been built from the outset as 2-storey buildings or which could be modified single storey buildings - did not offer sufficient structural integrity to survive a major seismic incident in safety.

6.4.9.5 Making alterations to existing housing in an earthquake resistant manner

A major problem for families considering extending their existing home upwards is the issue of finance. As has been explored previously in the Delphi results and discussion section, there is a general dearth of housing finance options available for the majority of income levels in Nicaragua. For the majority of families, it is very difficult to obtain home improvement loans - or any other types of loans - from banks or other lending institutions, including when families are homeowners. For the majority of the population, if lending is made available it is associated with very high rates for repayment. During the course of this study the author has not become aware of any home improvement lending scheme operated by Nicaraguan government, NGOs, the international cooperation agencies of foreign governments or any other type of international cooperation organisation whose aim is to offer housing finance more accessibly or at more competitive interest rates than the private sector.

As has been explained, carrying out vertical extensions to existing housing normally involves significant up-front costs and this is greatly increased if the foundations, columns and beams required for earthquake resistant construction are retrofitted to the existing property. The size of the up-front costs and the lack of finance options means that, according to the Delphi participants, a great many vertical extensions made to existing properties in Nicaragua do not include the retrofitting work necessary to make the finished building earthquake resistant. Such retrofitting is necessary because as has already been made clear, the huge majority of single storey dwelling structures are not constructed with the foundations, columns and beams built in that would be required so that any future vertical extensions are earthquake resistant. In seismic resistant construction the design and the supportive capacity of the foundations and of the ground floor is critical to conferring overall safety to the whole structure. In fact, the Delphi participants have stated that in many cases, dwelling structures built on a single storey don’t actually possess any foundations at all.

Having a dwelling structure with the foundations necessary to support the weight of more than a single storey in a way that is resistant to seismic activity requires a level of planning and financial investment when the building is begun that is far in excess of what the typical family building a livable single storey building is capable of - in terms of financial and technical means as well as financial and technical planning.

6.4.9.6 Where the state is involved in developing housing what reduces its ability to develop housing on more than a single storey?

In Nicaragua, as regards the professional areas related to urban development - such as urban planning, housing, community development, project planning and external cooperation - continuing professional development and encouraging professionals to engage in a dialogue on ideas has been relatively neglected. This has meant that, despite the technology and innovation in earthquake resistant construction existing internationally to safely and affordably build on more than a single storey in earthquake zones, in Nicaragua the idea of building housing on more than a single storey continues to be widely seen as a major safety risk.

Part 4, Evaluation and conclusion

Chapter 7. Evaluation of the challenges to residential densification

7.1 Introduction

In this research a mixed methods approach has been employed to look at housing typology, housing density, urban sprawl and the possible application of compact city thinking and residential densification in four Nicaraguan case study cities, Granada, León, Masaya and Matagalpa. The cities are all secondary cities in Pacific Nicaragua.

The author's analysis of key definitions of urban sprawl provided by Ewing et al (Ewing et al., 2008), Peiser (Peiser, 2001) and Downs (Downs, 2000) has revealed that there is only one 'common definitive characteristic of sprawl' that all three include. It is that of low intensity/inefficient use of land. Within this, Ewing, Schmidt et al (Ewing et al., 2008) and Downs (Downs, 2000) refer more specifically to low-density residential development. Compact city thinking and residential densification target this central aspect of urban sprawl.

The purpose of this chapter is to evaluate the findings generated in parts 2 and 3 of the thesis with reference to literature in order to directly address the thesis' sub-aim (to identify and explore the challenges to residential densification in Nicaraguan secondary cities).

7.2 The development of a housing typology for Nicaraguan secondary cities

7.2.1 Introduction

This study has resulted in the formulation of the first typology of housing for

Nicaraguan secondary cities. After developing the typology with accompanying density readings for each housing type it is possible to evaluate which housing types contribute most to urban sprawl and form the greatest challenge to developing more compact models of urban development. On the other hand, it is also possible to identify which housing types contribute least to sprawl and potentially provide opportunities for more compact development.

The analysis of these themes in the data in chapter 5 and the evaluation of findings in this chapter fulfills research objective 1 as articulated in chapter 1.

7.2.2 Evaluation of findings

Using the 4 case study cities, 8 housing types were established which together represent the variety of housing stock currently found in Nicaraguan secondary cities. Comprising the typology are types A1 to A6, all of which represent housing developed through formal processes and types A7 to A8 which are representative of housing developed through informal means.

A particularly significant outcome from the formulation of the housing typology was that, of all of the 8 housing types, only one, A6 (containing sub-types A6a and A6b), represents housing that was planned and built in its original form with more than a single storey. This is indicative of the fact that the great majority of housing in Nicaraguan secondary cities comprises single storey dwelling structures.

The table in fig. 7.1 below shows the mean average net residential densities measured for each of the housing types A1 to A6 with a summary of the characteristics of those housing types. The types have been arranged in order of increasing mean average density.

Housing type	Mean average density (in dph)
A4: Modern (mostly built from approximately 1990 onwards) detached housing, occupied by high-income families and located in peripheral urban areas	3
A1: Historic colonial style housing located in the central urban area with no significant subdivision	15
SUB-TYPE A6a: Areas of housing in which all units were planned and built as 2-storey structures, with each structure occupied by a single family *	31
A2: Historic colonial style housing located in the central urban area with significant subdivision	36
A3: Modern (mostly built from approximately 1970 onwards) areas of housing that have been masterplanned and built as a single project, comprising detached housing units, occupied by low-income families and mainly located in peripheral urban areas	42
A5: Modern (mostly built from approximately 1980 onwards) terraced housing, including areas of back-to-back housing, occupied by low and middle-income families and located in peripheral urban areas	56
SUB-TYPE A6b: Areas of housing in which all units were planned and built as structures with 3 or more storeys, with each structure divided up into multiple single family dwelling units *	118
* Note: sub-types A6a and A6b belong to the housing type A6: Modern (mostly built from approximately 1980 onwards) areas of housing that have been master planned and built as a single project, comprising multi-storey dwelling structures, occupied by low-income families and located in central and peripheral areas	

Fig.7.1

The density data for the different housing types and for the range of test sites used for each housing type was analysed in detail in chapter 5. This included analysing figures calculated for the standard deviation of the densities found for each of the different test sites used for each housing type. It also involved analysing figures calculated for the standard deviation of the areas/dimensions of the different test sites used for each housing type.

The mean average net residential densities for the different housing types as presented in fig. 7.1 give an indication of the extent to which each housing type contributes to low density urban sprawl in Nicaraguan secondary cities. The average densities also give an indication of the potential for certain housing types to become part of more compact house building solutions to counter low density urban sprawl. The information in figures 7.2 and 7.3 below is invaluable in helping to determine this. Fig. 7.2 lays out some useful highlights from current international thinking about how net residential densities of different levels can be interpreted. Fig. 7.2 is based on work by Fulford (1996) which in turn was based upon work by Newman and Kenworthy (1989) and Friends of the Earth (2011). In fig. 7.3 bands for low, medium and high density are presented which were formed by the author based on information from literature, including that in fig. 7.2, as well as on other work by Fulford (1996) and Friends of the Earth (2011) When judging the significance of the mean average net residential densities collected as part of this study recourse to international thinking is required as there has been an absence of research and debate in Nicaragua on this area and there are no similar figures available for Nicaragua specifically. A detailed account of how the data in figures 7.2 and 7.3 were put together is available in chapter 5.

Optimal net residential density to enable ….	Density in dph
Public transport	38 – 50
Walking	125
Sustainable urban	94 – 138
Central/accessible urban	Up to 154

Fig.7.2. Table showing the current best attempts of the academic community to define optimum urban net residential densities for a variety of ‘urban sustainability scenarios’ for use as an international guide. The figures are given in pph and dph (which was calculated using the UK mean average number of people per household).

Density category	Range of net residential densities (in dph)
Low-density	less than 30
Medium-density	30 – 95
High-density	More than 95

Fig.7.3. Table showing the author’s calculation of the bands of densities that should be used to classify areas of housing as low, medium and high-density for the purposes of this thesis. This is based on the international guide figures for optimum densities as expressed in dph.

The mean average net residential densities of housing types A4 and A1 are both well within the low-density band in fig. 61. In fact, the densities of all of the test sites used for types A4 and A1 are also within the low density band. One of the characteristics of both of these housing types is that the housing is occupied by high income families. Observation by the author during the study and data from the Delphi process indicated that housing units in these housing types were also generally occupied by relatively small numbers of individuals. Together these findings suggest that housing types A4 and A1 are major contributors to low density urban sprawl in the case study cities. Interestingly, type A4 is located peripherally in cities and such housing was seen in the study to directly advance the outward low density spread of the cities. Type A1 is located centrally in the historic core of the case study cities and was seen in the study to create areas in the central parts of cities where relatively few people lived and relatively little economic activity took place.

Housing sub-type A6a (areas of housing in which all units were planned and built as 2-storey structures, with each structure occupied by a single family) has a mean average net residential density of 31, only 1 point above the boundary between low and medium density and therefore only 2 points from being classified as low-density. This is particularly notable, as this sub-type, together with sub-type A6b, is the only to feature housing planned and built in its original form as more than a single storey structure. In fact, many of the Delphi participants spoke about the goal of planning and building much more housing in Nicaragua on more than a single storey (realistically 2 or 3 storeys) in order to contribute to more compact models of urban development. Sub-type A6a is part of type 6, which is ‘modern’ housing - in the case of type 6, built since approximately 1980. Clearly, planning and building modern housing on more than a single storey is a positive tool to have in order to bring about residential densification and more compact models of urban development. However, Delphi participants identified that it was common for modern Nicaraguan housing to be built with relatively large plots, relatively large amounts of space between neighbouring plots and/or neighbouring structures and large amounts of space used for access roads and road verges etc. This is a barrier to promoting residential densification and more compact models of urban development whether housing is built on 1, 2 or 3 storeys.

The comparison between housing type A2 (historic colonial style housing located in the central urban area with significant subdivision) and type A1 (historic colonial style housing located in the central urban area with no significant subdivision) provides a fascinating demonstration of the effect of sub-division on mean average net residential density. Housing blocks making up type A1 and A2 housing were founded when Nicaragua was under colonial rule from Spain and all would have started their lives made up entirely of non-subdivided housing. Sub-division has occurred to a small extent in some type A1 housing blocks - 'not-significant sub-division' - and has to a significant extent in type A2 housing blocks. The difference in mean average net residential density occurred between types A1 (15 dph) and A2 (36 dph) is representative of the increase in density and the residential densification that is possible through sub-division. The Delphi data agrees with this in that the Delphi participants spoke about barriers to sub-division constituting barriers to residential densification.

As was made clear earlier in the thesis, this study focuses on producing work that is relevant for developing parts of the world where low density urban form is dominant, Nicaragua being an example of such a part of the world. South Africa is the only developing country where low density urban form is dominant where written material available internationally has been compiled which discusses approaches to residential densification (The City of Cape Town Spatial Planning and Urban Design Department, 2009) (Arrigone 1995) (Irurah and Boshoff, 2003). These pieces of literature from South Africa outline practical strategies for achieving residential densification in practice.

That sub-division of existing structures has resulted in residential densification in the case study cities corresponds well with the work of (The City of Cape Town Spatial Planning and Urban Design Department, 2009), Arrigone (1995) and (Irurah and Boshoff, 2003) that found that the broad approach to densification of making changes lot by lot within existing urban areas is effective. The material from South Africa looked at densification on lots which are already developed but where extensions/expansions can be made onto or next to existing structures or where subdivision of structures or lots can occur.

Sub-division of existing structures resulting in residential densification in the case study cities also fits in with work by Danielsen et al (1999) which identifies the sub-division of existing residential plots and structures as key methods of residential densification. Although the work of Danielsen et al (1999) was based on the United States rather than a developing country, they see the sub-division of existing plots and structures, and residential densification more widely, in an international context as a effective method for achieving what they term ‘smart growth (p.513).

In the case of the current colonial Spanish style housing stock found in the case study cities, sub-division has not resulted in drastically higher housing densities. Even after sub-division mean average net residential density for the historic colonial style housing is only 36 dph - at the extreme lower level end of the medium density band. However, this is only a reflection of the fact that currently sub-division of colonial Spanish style housing stock does not occur in great quantities.

Type A3 housing (modern (mostly built from approximately 1970 onwards) areas of housing that have been masterplanned and built as a single project, comprising detached housing units, occupied by low-income families and mainly located in peripheral urban areas) has a mean average net residential density of 42 dph while the figure for type A5 housing (modern (mostly built from approximately 1980 onwards) terraced housing, including areas of back-to-back housing, occupied by low and middle-income families and located in peripheral urban areas) is 56 dph. With type A5 housing, housing structures are built up to the boundaries of the housing plots on which they sit. Observation by the author and data from the Delphi process demonstrated that type A5 housing is consistently a desirable housing type for middle income people with a far greater degree of housing options available to them than low-income people. Observation and the Delphi process also revealed that the interior space supplied by type A5 housing units is generally considerable relative to type A3 housing. The difference between the mean average net residential densities for type A3 and A5 housing demonstrates that building housing structures up to the boundaries of the housing plots can result in a substantially increased mean average net residential density and is a way of bringing about residential densification.

Key pieces of literature on densification from South Africa referred to earlier in this section (The City of Cape Town Spatial Planning and Urban Design Department, 2009) (Arrigone 1995) (Irurah and Boshoff, 2003) identify that making changes lot by lot within existing urban areas is effective as a broad approach to densification. Building housing structures up to the boundaries of plots fits within the broad approach identified in the literature from South Africa and has clearly resulted in residential densification in the case study cities. It is a central characteristic of housing type A5, which as a type has proven desirable to middle income families in the case study cities - who possess far more housing options than low income families. As mentioned above, housing type A5 generally provides in the case study cities an amount of interior living space which compares relatively favourably with other housing types.

Finally, housing sub-type A6b: (areas of housing in which all units were planned and built as structures with 3 or more storeys, with each structure divided up into multiple single family dwelling units) is part of the housing type A6 (modern, mostly built from approximately 1980 onwards) areas of housing that have been master planned and built as a single project, comprising multi-storey dwelling structures, occupied by low-income families and located in central and peripheral areas). The mean average net residential density for sub-type A6b is 118 dph which makes it the only of the housing types to lie within the high density housing band and the only to qualify as a ‘sustainable urban’ form of housing, according to the range of classifications shown in fig.60. This demonstrates that housing of significant density does exist in Nicaragua, that it has functioned and continues to function and that it is possible with housing structures of a relatively moderate number of storeys - the housing on the test sites had 3 or 4 storeys.

7.3 The experience and perceptions of Nicaraguan urban development professionals of urban sprawl, compact city thinking and residential densification

7.3.1 Introduction

The analysis of the data from the Delphi process on the experience and perceptions of Nicaraguan urban development professionals of urban sprawl, compact city thinking and residential densification in chapter 6 and the evaluation of findings here fulfills research objective 2 as articulated in chapter 1. In doing this, any challenges to more compact development in the case study cities, including through residential densification, in terms of support/lack of support, suggestions/lack of suggestions or knowledge/lack of knowledge from the urban development professionals will be identified.

7.3.2 Evaluation of findings

All of the Delphi participants experience significant low density urban sprawl in the cities in which they work and they all experience it as a problem. They all also stated that urban sprawl in their city was a result of the inefficient use of land through development at low densities, including housing development. All participants had a basic understanding of the concept of development density and housing density.

All of the Delphi participants thought that, on balance, the principles of compact city thinking would be positive for the city in which they worked and would be an improvement on the current situation.

The concept of residential densification was introduced during the 1st round Delphi questionnaire and all of the participants understood what it meant and commented that it was important to use it in their city in order to work towards the principles of the compact city and to avoid future low-density urban sprawl. All participants were of the opinion that residential densification in the city in which they worked would be greatly beneficial to the city and would help avoid future low-density urban sprawl.

These findings suggest that the perceptions of the Nicaraguan urban development professionals taking part in the study about urban sprawl, the ideas of the compact city and residential densification as applied to the case study cities do not constitute a major challenge or barrier to residential densification taking place. In fact, the perceptions/views actually represent an opportunity to build momentum towards achieving residential densification based on support from the study participants.

7.4 The perceptions of the urban development professionals on possible methods for residential densification

7.4.1 Introduction

The analysis of the data from the Delphi process on the perceptions of Nicaraguan urban development professionals on possible methods for residential densification in chapter 6 and the evaluation of findings here fulfills research objective 3 as articulated in chapter 1.

In doing this, any challenges to residential densification in the case study cities, in terms of the urban development professionals' suggestions/lack of suggestions for methods of densification or knowledge/lack of knowledge on methods of densification from the will be identified.

Alternatively, it is also possible to identify opportunities for residential densification. Certain methods of densification identified by the Delphi participants link particularly strongly with key findings established from the development of the housing typology in terms of matching methods of residential densification and housing types which offer especially strong possibilities for future residential densification.

The data from the Delphi participants' was grouped as part of this study into the 3 categories of methods of residential densification provided in key literature from South Africa on the subject (The City of Cape Town Spatial Planning and Urban Design Department, 2009).

7.4.2 Evaluation of findings

Housing type A1 (historic colonial style housing located in the central urban area with no significant subdivision) was found to have a mean average net residential density of 15 dph while the figure for type A2 (historic colonial style housing located in the central urban area with significant subdivision) is 36 dph. This is representative of the increase in density and the residential densification that is possible through sub-division. Meanwhile, the Delphi participants identified the ‘sub-division within existing large residential structures into a number of individual dwellings’ as an appropriate method for residential densification in the case study cities. A related appropriate method identified by the Delphi participants was ‘the sub-division of existing residential plots.’

Type A3 housing (modern, mostly built from approximately 1970 onwards) areas of housing that have been masterplanned and built as a single project, comprising detached housing units, occupied by low-income families and mainly located in peripheral urban areas) has a mean average net residential density of 42 dph while the figure for type A5 housing (modern (mostly built from approximately 1980 onwards) terraced housing, including areas of back-to-back housing, occupied by low and middle-income families and located in peripheral urban areas) is 56 dph. With type A5 housing, housing structures are built up to the boundaries of the housing plots on which they sit. The difference between the mean average net residential densities for type A3 and A5 housing demonstrates that building housing structures up to the boundaries of the housing plots can result in a substantially increased mean average net residential density and is a way of bringing about residential densification. Linked to this, the Delphi participants identified ‘building of residential structures which extend to meet one or more of the plot edges’ as an appropriate method of residential densification.

Housing sub-type A6b (areas of housing in which all units were planned and built as structures with 3 or more storeys, with each structure divided up into multiple single family dwelling units) is part of the housing type A6 (modern (mostly built from approximately 1980 onwards) areas of housing that have been master planned and built as a single project, comprising multi-storey dwelling structures, occupied by low-income families and located in central and peripheral areas). The mean average net residential density for sub-type A6b is 118 dph which makes it the only of the housing types to lie within the high density housing band and the only to qualify as a ‘sustainable urban’ form of housing, according to the range of classifications shown in fig.60. Meanwhile, the Delphi participants identified the ‘building of residential structures of more than a single storey (such structures could contain a single dwelling unit or multiple dwelling units)’ as an appropriate method of residential densification.

7.5 Assessing the urban development professionals’ technical knowledge of measuring housing density

Exploring the technical understanding / knowledge of the Nicaraguan urban development professionals on measuring housing density makes it possible to determine whether their levels of understanding / knowledge constituted a challenge or an opportunity to instigating more compact patterns of urban development including residential densification in the case study cities.

Despite all of the participants having an effective general understanding of the concept of density, the data makes it clear that a major barrier to residential occurring in the case study cities is participants' incomplete knowledge on technical aspects of housing density, specifically how numeric measures of housing density are made. Knowledge differs across the set of participants but the fact that any of these participants, who are urban development professionals, have incomplete knowledge is a barrier to the evolution of responses to low density urban sprawl. Knowledge of numeric measures of housing density was specifically looked at as it serves as a barometer of their technical knowledge on housing density generally - the measures are, after all, the essential way of quantifying the phenomenon.

7.6 Urban development professionals' experience and perceptions of barriers to residential densification in the case study cities

7.6.1 Introduction

The Delphi process conducted as part of this study provides for the first time a multi-city consultation of Nicaraguan urban development professionals on the barriers to residential densification in Nicaraguan secondary cities. The Delphi process identified a wide variety of types of barriers; from construction related to political and from training related to those connected to families' housing finance arrangements, as well as many more. The process was designed to give the Delphi participants as much freedom as possible to identify barriers of whatever type existed. For the purposes of presenting the barriers in writing within this thesis, themes (1-10) were created in order to group the barriers and to give their presentation structure.

The challenges or barriers to residential densification discussed in this section add to, complement and extend the challenges already identified in this chapter, which were identified through the development of the housing typology and in the earlier topics discussed in the Delphi process.

The barriers discussed below are organised by theme.

7.6.2 Theme 1: the culture of low housing density in Nicaragua and the case study cities

Work by a number of writers (Briggs and Yeboah 2001) (Kreibich, 2010) (Van Ballegooijen and Rocco, 2013) (Smit, 1979) (Ribbeck, 2007) describes the myriad sprawling low-density neighbourhoods that have developed in a number of sub-Saharan African cities. The work raises some issues that this study has detected in Nicaraguan secondary cities. Briggs and Yeboah (2001) identify that many urban areas in sub-Saharan Africa have a ‘rural character,’ or in a spatial sense a rural culture. A central feature of such urban communities which makes them seem rural or at least partially rural in character is the low housing density exhibited consistently across the communities. The families in question live on large residential plots, they exclusively occupy low-rise structures and they use much of the significant amounts of outside space they have within the plots to keep animals and grow food.

Based on data from the Delphi process, but also from the following sources: the housing typology developed as part of this study; the author's study of Nicaraguan policy documents, plans and legislation; and the author's own observations, the 'rural housing density practices' identified by Briggs and Yeboah in African cities, are also evident in the Nicaraguan case study cities. In many areas of all 4 case study cities all of the main components of the picture in African cities are present, namely: the low housing density exhibited consistently across the urban communities, the large residential plots, the presence of only single storey structures and the large amounts of private outside space within residential plots within which families often keep animals and grow food. In addition, the Delphi participants described a picture of housing development in the case study cities heavily influenced by 'rural thinking' that closely mirrors what Briggs and Yeboah observed in African cities. Individual families as well as social, financial and political structures in the case study cities and nationwide develop housing in a way that is heavily influenced by 'rural thinking' as part of a wider societal view of the world still deeply shaped by agriculture and the countryside.

The Delphi participants noted that the 'rural character' - or rural culture in a spatial sense - of much of urban life was highly ingrained in many parts of Nicaraguan secondary cities. They explained how these patterns experienced across Nicaragua were manifest in all 4 of the case study cities. In the literature describing low-density urban form with a 'rural character' in sub-Saharan African cities it was identified that the native culture, background and lifestyle experience of residents of the cities are imbedded in 'rurality' because of their rural provenance, or that of their ancestors, as well as that of the society in which they live (Van Ballegooijen and Rocco, 2013) (Smit, 1979) (Ribbeck, 2007).

One of the major points which emerged from the Delphi data was that precisely because ‘low density life’ had become so ingrained in many parts of the case study cities and across Nicaragua this formed a major cultural barrier to the implementation of more compact urban development strategies.

7.6.3 Theme 2: governance and density in Nicaragua and the case study cities

The Delphi process revealed that a critical factor concerning governance and density in Nicaraguan secondary cities is the central role that nepotism plays in determining who occupies which jobs and in charting certain people’s career progression in the urban development professions. In Nicaragua, nepotism is widespread, including - some would say especially - in the public sector. The term ‘political appointment‘ is often used in Nicaragua to describe the appointment of a person to a post without there being a fair and transparent process to advertise the post and/or to select the best candidate for the job. The responses of the Delphi participants and the author’s own observations revealed that political appointments are very common in the local governments of all 4 case study cities - and particularly common in Granada and Matagalpa. Political appointments are also extremely common in central government ministries and in public sector agencies operating at arms length from government. Within all of these publicly funded organisations the areas of urban planning and housing are very much affected by this phenomenon.

Nye in 1970 penned what has become a well known and oft-referenced definition of corruption (p. 966) which is as follows:

> *Corruption is behavior which deviates from the formal duties of a*

> *public role because of private regarding (personal, close family, private clique) pecuniary or status gains; or violates rules against the exercise of certain types of private regarding influence.*

The definition contains an interesting term, ‘private regarding,’ as in ‘private regarding … status gains’ or ‘private regarding influence’ (Nye, 1970, p. 966). In the case of the Nicaraguan case study cities, the Delphi participants identify that ‘private regarding’ behavior takes place in the way that people are appointed to posts within the urban development professions. This is ‘private regarding’ (providing private benefit) for those responsible for making the appointments – this typically involves appointing friends or family or a person in the expectation of receiving a favour from them in the future – as well as for those being placed in the posts.

Hutchcroft (1997) writes that opposition to corruption in the ‘modern’ world has developed over time from being based mainly on moralistic grounds to employing cost benefit analyses of its exact effect to highlight specific governance and developmental deficiencies that result in how countries and organisations operate - and whether or not progress in the development arena is achieved.

Based on the insight provided by Hutchcroft (1997), the practical governance and developmental deficiencies identified by the Delphi participants which result from nepotism in job appointments can be interpreted. The prevalence of political appointments in the areas of urban planning and housing in the institutions discussed forms a key barrier to residential densification - and indeed to progress in any area of planning and housing. A critical point is that if decisions over recruitment are determined ‘politically’ - through nepotism - than the supposed central purpose of recruitment, namely to find select the best person for the job, is lost. In the case study cities this means that local government is not doing as good a job as it could be doing in the areas of policy, development control and project planning. This is true for the day to day functioning of the institution and the deployment of its duties to the public but also critically in terms of its ability to conceive and develop new ways of working to adapt to changing urban realities. More compact urban development and residential densification are relatively new and even niche ideas at present in Nicaragua and hard work, vision and creativity will be required from capable and talented professionals to make progress in these areas. Even if this did happen it will be challenging for such planners and housing professionals to convince others such as professionals in other areas in government, elected members without much knowledge of planning/housing and the public of the merits of adapting to a new way of living.

Another major barrier to residential densification identified by almost all of the Delphi participants was the lack of understanding shown by elected members in government on matters of planning and housing. The participants were aware that this was a significant problem at national level but they were able to provide the most vivid picture of this problem at local government level. More specifically, according to the participants, local councillors were simply not aware of the problems caused by low-density urban sprawl and most were unlikely even to know what it was. Another issue which Delphi participants claimed forms an obstacle to residential densification was the poor communication which generally exists between civil servants employed in local government in posts in planning and housing and the elected members. Furthermore, Delphi participants explained that one of the symptoms of elected members’ lack of meaningful engagement with planning and housing that they felt most keenly was an absence of leadership.

In addition, slightly over half of the Delphi participants identified that a huge variation exists between the planning frameworks which had developed and are currently used in different municipalities across Nicaragua. Concerning the case study cities, there is significant variation between the planning frameworks used within the municipal governments. In each municipality, the frameworks which govern how urban plans are formed and how they influence decision making and how development control powers are deployed are based on a set of unique locally produced documents. The participants described a situation whereby in each municipality the key planning documents which set out planning principles, procedures, guidance for decision makers and relevant legislation for the municipality are an amalgam of extracts from national texts (such as the NTON suite of documents and local municipal orders). This constitutes a major barrier to residential densification. Even if national government or one/some municipal government(s) were fully aware of the problems of low-density urban sprawl and wanted to work through the planning system to bring about a reduction there is no mechanism to share good practice by making the same changes to multiple municipalities. All the municipalities not only have their own planning system but their own system for drawing up the key documents on which the system rests.

Finally, the variation from one local government to another described here also makes it almost impossible for people from one municipality or people at a national level to understand the way ‘planning is done’ in another municipality. It is therefore extremely challenging for anybody to become well versed in ‘Nicaraguan planning’ and to successfully advocate positive change, e.g. embracing more compact residential development patterns across the country or even across a region.

7.6.4 Theme 3: professional development and dialogue on ideas for Nicaraguan urban development professionals

As regards professional areas within the field of urban development in Nicaragua, such as urban planning, housing, community development, project planning and external cooperation, the concept and practice of continuing professional development and encouraging professionals to engage in an dialogue on ideas is relatively neglected in Nicaragua.

The Delphi participants identified that one of the few ways in which continuing professional development and encouraging professionals to engage in a dialogue on ideas does occur is through city to city (C2C) cooperation. The C2C partnerships which have been most organised, strategic and enduring in doing this in Nicaragua have undoubtedly been the partnerships between Nicaraguan and Dutch cities.

This chimes with what was found during the scoping research conducted as part of this study, that in Nicaraguan secondary cities programmes of international cooperation very frequently support local Nicaraguan institutions including municipal government, both in terms of financing and capacity – which included providing training to build capacity and provide professional development. Montiel and Barten (Montiel and Barten, 1999) describe how, in recent years, international organisations working in Nicaragua have found it more productive to collaborate directly with local government in secondary cities rather than dealing with central government – which has, at times, been so polarised by political divisions that it has been incapable of reaching negotiated decisions or offering effective direction on development matters. Some of the cooperation efforts they observed involved training to build capacity and provide professional development.

Although literature is available on the philosophy of C2C, according to Tjandradewi et al (Tjandradewi et al., 2006), 'surprisingly little research and few evaluations of programmes have been undertaken' discussing the actual work; the training, capacity building and professional development provided; and critically the nature of the 'local institutional' approach, of C2C partnerships internationally. In addition, C2C involvement in urban planning and housing seems to have been particularly neglected as an area of study.

The potential of C2C cooperation to provide professional development / training / capacity building may be a fruitful area of research for the future.

The issues discussed in this theme affect the ability of professionals to develop their thinking on planning, housing and specifically density issues but also affects their capacity to share ideas once they develop them.

Nicaraguan urban development professions would have far greater capacity to respond to the country's requirements in the area of urban housing and to incorporate elements of the latest international thinking if there were increased opportunity and ambition for capacity building and international professional engagement in the country.

For example, in areas like strategic policy planning and in the technical aspects of earthquake resistant higher-density construction - both of which are discussed in this thesis as areas where lack of knowledge and experience creates major barriers to densification - greater and more effective work based collaboration with professionals and academics outside of Nicaragua is critically required.

7.6.5 Theme 4: the formation of policy in the areas of planning and housing, including on residential densification and its implementation

Where urban planning and urban housing policy has proposed changes in the case study cities linked to more compact urban development and residential densification, very serious problems with policy implementation have often resulted in these changes not taking place. Implementation - or non-implementation - of existing policy is a serious barrier to progress towards more compact urban development and residential densification in the case study cities. In addition, poor policy implementation has also resulted in some of the most alarming cases of wasted time and money in the case study cities encountered by the author during this study.

For example, at the time of the Delphi research being conducted, in Granada it looked very certain that the city's much planned urban extension - whose planning involved the creation of numerous time consuming plans and other policy documents - would never even be started, in Matagalpa it seemed the same. In Masaya and particularly in León progress had been better but was nowhere near complete.

In the scoping research which formed the initial exploratory part of this research (see chapter 3, methodology) it was noted that in spite of the benefits of planning and carrying out development work at a local level, even at this level urban planning and housing plans and policies in Nicaraguan secondary cities are still often left unimplemented or largely unimplemented in practice. The scoping research found that in each of the four case study cities there have been elaborate and well formed plans and policies which have required the mobilisation of large amounts of resources and the completion of a complicated series of actions in order to bring about completion, or even partial completion. Each plan or policy drawn up would undoubtedly have required much in the way of time and resources to complete but they have often been left either completely or partially unimplemented, even after a number of years of supposedly being 'active' as plans/policies.

In terms of identifying policy implementation as a major challenge to residential densification, it is evident that there is a correlation between the data provided by the Delphi participants and that provided by the scoping research.

The challenges of policy implementation in developing countries are well noted in academic literature. Adamolekun (Makinde, 2005) defines policy implementation as 'the activities that are carried out in the light of established policies.' According to Makinde (2005, p. 63), 'policy implementation is one of the major problems confronting developing nations.' However, it has been impossible to identify any existing academic literature or any material from practice that is visible internationally - or has been available from sources accessible to the author in Nicaragua - covering the area of policy implementation (or the lack of it) in the area of urban planning and housing in Nicaragua.

Within international literature about making policy implementation more achievable the term 'pragmatic incrementalism' has been used by Bryant (2003, p. 9) and

Evans et al (Evans et al., 2005). They both identify it as an effective approach to achieving change at a local level.

Regarding policy, (Bryant, 2003) warns against ‘unrealistically demand[ing] too much,’ proposing instead an approach to policy of ‘pragmatic incrementalism’ whose goal is a ‘gradual strengthening’ (p. 9) in the depth and distribution of the desired outcomes. Policy need not mean plans for wholesale change requiring huge amounts of resources and a complicated series of actions to implement – as was proposed in the policies and plans formed and left largely unimplemented in the case study cities – but policy can propose small pragmatic changes which as part of a larger incremental trend over time can result in real change.

It is clear from this research that the four case study cities have a history of either mixed, poor or very poor implementation of existing policy documents and/or plans. It is likely a productive approach to developing an agenda for real change in the area of residential densification would be to avoid repeating the mistakes of the past. Although it is not possible to identify any existing literature covering ‘pragmatic incrementalism’ in Nicaragua, it is possible that the concept as outlined by Bryant (2003) could be productive in future in the case study cities. Rather than propose wholesale change requiring huge amounts of resources and a complicated series of actions to implement the focus of policy and/or plans could instead be on planning and fostering pragmatic and incremental changes.

7.6.6 Theme 5: very little new house building, residential infill development not taking place and a shortage of actors capable of and willing to build new houses

All of the Delphi participants identified that currently, in all of the case study cities, there is very little building of new houses. The majority of the participants reported that this has been a problem throughout Nicaragua's urban areas, particularly for low-income families, since 1990 when Nicaragua's socialist revolution came to an end. Participants commented that Nicaragua has seen a reduction in state involvement in house building since the beginning of the 1990s. Some participants were able to relate these changes to the overarching political changes felt worldwide as part of the 'Washington consensus' – changes that were delayed in Nicaragua as compared to most other countries around the world because Nicaragua's Revolution during the 1980s insulated it from the pro-market forces approach embraced by the international community from the 1970s onwards.

The Delphi participants confirmed that in Nicaragua, since the widespread removal of the state from housebuilding in the early 1990s after the country's period of revolutionary government had ended, the formal private sector has indeed failed to build houses and provide housing finance for the huge majority of families. In particular, the formal private sector has very largely failed to take over from the state the role of house builder for the urban poor. This is in spite of the assertion within structural adjustment philosophy that private companies operating in the free market must take on the mantle of house builder for all sectors including the low income sector.

The Delphi participants portrayal of changes in Nicaragua to house building reflect the international picture since the 1980s, described by Angel (2000) whereby the World Bank and the IMF have spearheaded a change in countries throughout the world in the way that the state and the private sector's duties are distributed in the area of housing provision. (Dubcovsky, 1999) identifies that in Nicaragua, change associated with the structural adjustment movement started in the early 1990s and change was also at its most marked during that decade. (Sevilla, 2006a) identify that these changes reflected the economic and political philosophy of the neoliberal structural adjustment movement. Both the World Bank and the IMF lend money to governments of countries all over the world and both organisations have a huge amount of influence on the strategies those governments use to provide services, including housing, to their people. This pattern of lending is certainly true for countries in Central America including Nicaragua (Bank, 2014) 2009) (Fund, 2014).

(Robinson, 1997) and Booth and Walker (1999) provide more historical depth to our understanding of the changes in Nicaragua, stating that in 1996, Arnoldo Alemán representing the Liberal Alliance won control of the presidency and his party gained the majority in the National Assembly (Booth and Walker 1999). The period from 1990 to the end of 2001, saw these two governing groups - UNO and the Liberal Alliance - enthusiastically embrace neoliberalism and IMF/World Bank sponsored structural adjustment.

Interestingly, Booth and Walker (1999) highlight that in the late 1980s, the Sandinistas found themselves forced to make what call ‘structural reforms’ or cutbacks to the activity of the state. None of the Delphi participants mentioned that reductions in the activity of the state actually happened before the end of the Revolution. However, Booth and Walker (1999) make it clear that this was an attempt by the Sandinistas to control hyperinflation resulting mainly from expenditure on the contra war and did not represent a change in their core political philosophy. It certainly did not represent any desire to get closer to the neoliberal economic agenda espoused by the IMF and the World Bank (Prevost, 1997) (Booth and Walker 1999) (Spalding, 1994).

(Smith, 2005b) has said about neoliberal political and economic philosophy reducing the scope and range of what both central and local governments in poorer countries around the world can do to provide housing for middle and low income income groups.

Indeed, for Nicaragua's low income sector Delphi participants reported that it has been left to isolated ALBA (a bi-lateral state funding scheme in which the Venezuelan central government offer financial support to the Nicaraguan central government) funded central government projects mainly focussed in Managua, international cooperation organisations and national NGOs working with local government, and families themselves to build the limited number of formal sector housing units constructed in urban areas in the country since the beginning of the 1990s. Delphi participants described this situation in each of the four secondary cities. It is also a problem occurring in other developing countries around the world and has been identified by writers such as Helmsing (2003).

Without new house building by the formal sector - public or private - there is no chance of supplying the right type of housing, at the right price, in the right places and there is no prospect of achieving the consolidation of the case study urban areas as sites of efficient, compact development without urban sprawl. If housing which can help meet demand and contribute towards a more compact urban model is not supplied by the formal public or private sector then demand for new housing will be met by the informal sector, something that all of the Delphi participants were able to confirm is currently happening. The participants also made it clear that there is very little regulatory authorities can do to influence where informal housing develops and whether or not the choice of sites correlates with what is best for working towards the formation of more compact cities. In fact, participants confirmed the author's own observations that the very large majority of recently established areas of informal housing are located on the urban periphery where they create urban sprawl and fail to achieve infill development on the large amounts of vacant land present within existing urban areas. This situation forms a major barrier towards the undertaking of residential densification in the case study cities and the development of a more compact urban form for the case study cities.

The 'enabling approach' can be seen as a type of notional 'compromise' position for the state to adopt, somewhere between the pre-structural adjustment tradition of the state as house builder and the minimal role for the state advocated by supporters of the free market approach to house building. Stein and Vance (2008, p. 15) describe an enabler's primary duties as establishing a framework of norms and regulations, putting in place funding for land purchasing and organising core infrastructure and services. If the state in Nicaragua were to be able to act as an enabler of housing this could support potential private sector or NGO developers or those from the sphere of international cooperation in order to stimulate house building. However, factors were identified from the Delphi process which inhibit the Nicaraguan state from acting as an enabler. These are discussed in more detail in chapter 6.

7.6.7 Theme 6: building new houses: how is land obtained to do this?

The participants described how there has been and continues to be a failure of Nicaraguan legal, political and planning systems to facilitate the formal supply of appropriate land, at a price that is appropriate in the context of current economic conditions in the case study cities and that is in the right places to satisfy housing demand. This issue inhibits the formal public and private sectors from building housing.

All of the Delphi participants revealed that there continue to be very many empty plots of significant size in and around the case study cities. In terms of the effect on built form and overall density within the cities it is the large numbers of such plots in the ‘established urban area‘ of the cities which is of great concern. The participants revealed that barriers to obtaining land for housing development contribute to these plots not being developed and being left vacant.

The Delphi participants reiterated that it was the informal private sector which helped to meet demand for housing when the formal sector failed to do so. The participants also highlighted that because the informal private sector operated outside legal and planning frameworks it was virtually impossible for the state to steer this type of development towards meeting requirements for residential densification and more compact models of urban development, e.g. prioritising infill development and development at higher densities.

The Delphi participants highlighted that for the vast majority of the new housing developments in which the state had been involved in recent years in the 4 case study cities, it was local government and not central government/(INVUR - the central government agency for housing) that had worked to obtain the land required. In fact, the majority of the participants also identified that central government provide no or almost no support, leadership, guidance or resources to local government for the purposes of obtaining land for housing development in the case study cities.

The Delphi participants reported that the land market is relatively static and inactive in Nicaragua and there is a culture of landowners ‘sitting on their land’ even if the land is not in use. Landowners often set unrealistically high asking prices and frequently raise them further when they discover that the local municipal government is involved in the negotiations, the landowners believing that government has the resources to pay a higher price. In some cases, landowners are completely opposed to selling land to be used for low income housing projects because of an uninformed belief that such schemes will always offer them less financial benefit than if they sold the land or developed it themselves for other uses including for middle and high income housing.

Delphi participants explained that there does exist legislation created by central government (such as that giving local authorities compulsory purchase powers – or eminent domain powers as they are known in the United States of America (Pritchett, 2003)) to empower local authorities in land negotiations for projects to further the public good. However, the legislation cannot be put to use because it is associated with the Nicaragua’s 1980s revolution and the country’s political divisions, which occurred at that time.

Corrupting political interference interrupting the impartial functioning of compulsory purchase legislation is a developmental challenge that is familiar to a large number of academic writers, exploring the situation in a wide variety of developing countries (Wraith and Simpkins 2010) (Mamdani, 2008) (Burgess, 1982). However, the focus of debate so far has been mainly on the abuse of compulsory purchase legislation by government and/or members of political, social or economic elites in order to gain control of land in a corrupt manner.

More suited to the picture in Nicaragua, Macmillan (2000, p. 56) discusses the developmental limitations imposed by government who are only prepared or able to use compulsory purchase ‘sparingly’ in the face of highly restricted, monopolistic private ownership of land. Macmillan (2000) writes about Scotland and suggests that a barrier there to the implementation of compulsory purchase is that legislation only permits it in cases of ‘essential economic development’ (p. 56) and the definition of what constitutes essential economic development is overly narrow. Macmillan suggests broadening the interpretation of essential economic development to include, for example, bringing about community ownership of land in order to promote ‘essential’ changes to economic development to make it more equitable.

In the absence of literature which discusses Macmillan’s points in developing countries we are left with proposals made only in the context of Scotland – a very different context to that of Nicaragua. In Nicaragua, the problem is not only the formation of legislation and policy and how it is worded but also the gap between existing legislation and policy and its implementation. Adamolekun (Makinde, 2005) provides a useful definition of policy implementation which was used in theme 4 of this chapter and in chapter 6.

7.6.8 Theme 7: variation of density in new housing developments when the state assembles land and plans plot layout and individual occupants build dwelling structures

Where the state has been able to obtain land for the purposes of new housing developments, often working with and/or funded by international cooperation organisations, Delphi participants described that a common development model is for the state to be responsible for planning plot dimensions and layout and for individual occupant families to be responsible for building their dwelling structures. The Delphi participants described this process whereby the land is obtained formally and is sub-divided into plots for individual dwellings as part of a formal site design process. This has been done in at least one case in all of the case study cities since 1990 by local authorities working with international cooperation initiatives. The highest profile example of this in Nicaragua that has produced the greatest number of homes is the León South East urban extension.

Lopez (2006) describes the model in place in León and this source combined with data from the Delphi participants paints a picture which chimes with Stein and Vance’s assertion (2008, p. 15) that states across Central America including Nicaragua have completely lost the role they had previously occupied as a complete ‘provider of housing solutions,’ instead taking on the restricted role of ‘enabler.’

According to the Delphi participants, a barrier to residential densification and to developing compact residential form is that the form of development described here leaves a lot of effective control over density outside of the state's control. The participants acknowledged that under the model, state planning authorities have substantial influence over the layout and density of plot layout, but not over what type of structures end up on the land. ‘Type of structure’ can be taken to include: the number of storeys in a dwelling structure, or the proportion of a plot which is occupied by dwelling structures as opposed to outside/open space. If the housing itself is built by the owner occupiers some control over density is ceded by the state and it may not be possible to regulate density in any coherent way if having to work with every individual family house builder. Even in different development sites/situations where plot layout was the same, different types of construction by families could result in different density outcomes. For example, different families may build on different numbers of storeys, they may occupy different portions of plots with dwelling structures and they may sub-divide plots so that more than one dwelling structure is built on a single plot, with buildings or rooms being rented or sold to other families including members of the same extended families. All of these myriad options very significantly affects eventual housing density.

Yonder (1987) describes the haphazard areas of housing which developed in and around Istanbul as a result of government policy to grant land tenure to self-build families. In the example used by Yonder house building took place before and after government intervention. In the recent Nicaraguan examples of when the state assembles land and plans plot layout and individual occupants build dwelling structures, house building only comes after government intervention. As a result, development should be less haphazard in the Nicaraguan cases. However, leaving families responsible for developing on plots does create the potential for haphazard development to some extent, and certainly in terms of variation of density from one development to another or between different areas in the same development.

(Van Ballegooijen and Rocco, 2013), (Smit, 1979) and (Ribbeck, 2007) identify Kinshasa, capital of the Democratic Republic of Congo as a rather more extreme example of self-build by residents resulting in the development of a haphazard and very low density urban form. According to the same authors, in the case of

Kinshasa very little intervention from government in a planning or regulatory manner is usual. The author judges the level of intervention to be on average significantly less than in Nicaragua. (Van Ballegooijen and Rocco, 2013), (Smit, 1979) and (Ribbeck, 2007) describe Kinshasa as a city made up of a baffling arrangement of sprawling low density neighbourhoods, which mainly fails to offer any clear sense of legibility or definition - something which is often achieved in cities through diversity of urban form and/or density. Modern Kinshasa has largely arisen thanks to ‘self-help urbanisation’ (Van Ballegooijen and Rocco, 2013) (Smit, 1979) (Ribbeck, 2007), whereby residents have found themselves responsible for founding new areas of housing or adapting existing areas in which to live.

7.6.9 Theme 8: Making alterations to existing residential plots and dwelling structures

The sub-division of existing urban residential plots involves separating the space occupied by an original plot to produce one or more additional plots which can then be rented, sold or simply used by another party for residential purposes. Plot sub-division only involves the re-organisation of land/space in a plot as opposed to the re-organisation of how a dwelling structure is used as is the case with some other methods of residential densification. Existing residential plots that undergo sub-division can be empty of structures - in which case they have been developed to have or have been assigned a residential purpose but are not currently developed - or can have structures on - in which case it is the open space around the structure which is sub-divided (Mahtab – uz – Zahman and Lau, 2000).

In the Capetown densification strategy (The City of Cape Town Spatial Planning and Urban Design Department, 2009) and in chapter 6 of this thesis, based on data from the Delphi participants, factors which provide a stimulus for the sub-division of existing urban residential plots were identified. Chief among these is whether or not any significant financial incentive exists for the owners of residential plots in existing urban areas to sub-divide them. The Delphi participants identified that the land market in the case study cities is structurally ineffective and this means that opportunities for people to buy, sell or rent land including residential plots are relatively few and far between. This does not create any strong financial incentive to sub-divide plots.

Imposing legal obligations or financial penalties to encourage plot sub-division could be considered as suggested by Devas (1983), but without much chance of there being accompanying financial incentives, such policies may be seen by the public as authoritarian and heavy handed. The most appropriate way of using legislation and a system of financial penalties could be to apply them only to plots on which there are no dwelling structures at all or where there are particularly large amounts of unused land. This could obviously run the risk of becoming fraught with conflicting definitions of what exactly constitutes ‘unused’ or how large an area of unused land qualifies to be subject to legislation or financial penalties. In addition, a major barrier in the case study cities towards effective application of any legislation or policy continues to be the difficulties with governance and policy implementation outlined in detail in chapter 6 and earlier in this chapter.

Many of the Delphi participants believed that the national minimum distance between neighbouring detached homes established in the NTON suite of documents produced nationally in Nicaragua is overly generous. It was stated that if observed ‘to the letter’ the national minimum distance results in land being developed for housing in an inefficient way. If observed, this figure would make the sub-division of existing urban residential plots less effective as a tool of residential densification as it would reduce the area within plots created by subdivision that could be used for dwelling structures. However, the Delphi participants that spoke about the NTON minimum distance requirement all observed that in practice it was generally only applied to new housing planned and developed as part of a housing development containing multiple homes.

In addition, most of the Delphi participants identified the huge underused potential for residential densification in the existing historic cores of the cities in which they worked. They recommended the sub-division of existing historic structures into multiple dwellings. Major barriers to this possible method of residential densification include some of the same as those identified for the sub-division of existing plots, including Nicaragua’s relatively inactive residential property market not providing a financial incentive for owner’s subdivisions and the national minimum distances in the NTON national legislation to exist between neighbouring dwelling structures. However, as was identified earlier, the NTON regulations appear to be fairly unrigorously put into practice generally and the Delphi participants made clear that where they were put into practice the main focus of such regulations as they were currently interpreted were new housing developments rather than conversions of existing ones.

Finally, a further major barrier to the sub-division of existing historic properties is a lack of existing examples of sub-division and conversion demonstrating innovative and imaginative design. Thoughtful and creative schemes are required. For example, including how to use internal courtyards as successful semi-private shared spaces when converting large single properties to form multiple dwellings.

7.6.10 Theme 9: expertise and resources in earthquake resistant house building

The Delphi participants were all of the opinion that across Nicaragua there was generally very little capacity to build on more than a single storey in an earthquake resistant manner. Clearly, the ability to achieve residential densification by building new housing or updating existing housing by building upwards is affected.

From the Delphi data in this study as well as from observations of Nicaraguan cities made by the author it is clear that in the country's urban areas there are comparatively few housing structures which have more than a single storey. However, many of the Delphi participants feared that a large proportion of those that do exist have not been built using adequate anti-seismic methods.

If housing structures of more than a single storey were more widespread, the size of plot required for providing adequate internal living space for an average sized family or even for multiple families would obviously be very significantly smaller. In fact, it may be that if Nicaraguan housing was effectively released from the restriction of being limited to a single storey, the overall floor area of an average family house would increase with the flexibility and greater capacity that building on more than a single storey can bring. This is not certain, but after all, in any urban location land is the most finite of all the resources required to build a house!

After the reduction in 1990s of the Nicaraguan government's involvement in house building and housing development (Stein and Vance, 2008) and in the light of the failure of the formal private sector to 'step in' and take over the mantle of house builder/housing developer – in Nicaragua as in other developing countries (Smith, 2005b), Delphi participants reported that there can now be a great deal of pressure on Nicaragua’s families to self-build in order to provide housing, whether formally or informally.

The Delphi participants identified that the majority of families who self build simply do not have the technical awareness, experience or resources to plan or construct, using earthquake resistant engineering, the foundations necessary to support a building of more than a single storey (or one which could have an additional storey added to it in the future). Families’ lack of technical awareness, experience or resources is equally an issue for building the supportive columns and beams, using appropriate materials, which are involved in making a building resistant to seismic activity and which would need to be installed within a single storey structure if a second storey were then safely to be added at a later date.

Lewis (2003) has noted the same worrying issues of lack of earthquake protection with self-build housing in poorer countries around the world. Interestingly, he uses a country which is certainly not among the world’s poorest, Turkey, as an example of a state in which self-build development has resulted in very large amounts of housing on more than a single storey which does not meet adequate standards for seismic resistance. Lewis (2003) cites Peru as a country in which there have been exemplar projects for creating self build housing on more than a single storey which meet adequate standards for earthquake resistance.

Given relevant training, support and access to resources all of the above is possible for families who self build (Lewis, 2003). It has been done successfully and affordably around the world, though effective support frameworks are necessary in order to do this.

A number of the Delphi participants explained that a crucial addendum to the issue of earthquake resistant technical awareness, experience and/or resources for families self-building is that adequate finance must be available for families to make the up-front expenditure necessary to install the foundations, columns and beams to make a 2-storey (or higher) building resistant to seismic activity - or make the later construction of additional storeys safe. Carrying out vertical extensions to existing housing normally involves significant up-front costs and this is greatly increased if the foundations, columns and beams required for earthquake resistant construction are retrofitted to the existing property. For the majority of families, it is very difficult to obtain home improvement loans - or any other types of loans - from banks or other lending institutions, including when families are homeowners. For the majority of the population, if lending is made available it is associated with very high rates for repayment.

Chapter 8. Original offering to knowledge and scholarship

The purpose of this chapter is to provide a conclusion, which summarises what this thesis offers and how it is original as well as possible limitations of this study and ideas for future extension.

8.1 The author building on a significant track record of engagement in Nicaragua

This study is part of a history that the author has of research, teaching and project work in Nicaragua, during which time considerable self-reliance has been required but which has crucially also involved a great deal of very enjoyable and fruitful partnership working with Nicaraguans and international partners. The author lived and worked in Nicaragua for 3 years, between 2001 and 2004 and has maintained continued professional contact with the country since then. The author has made various trips to Nicaragua since 2004 and has developed a great deal of tacit knowledge on urban planning and housing as well as concerning the geography, culture and society of the country. Fluency in Nicaraguan Spanish also means that the author did not have to use an interpreter/translator for research in the country and could, as a result, get closer to the subject and the participants.

8.2 A pragmatic epistemological approach absorbing elements of positivism and Grounded Theory

As epistemologies, positivism and Grounded Theory aim to frame and structure the process of creating knowledge. For positivism, the trajectory of knowledge creation starts from a hypothesis developed from existing theory which is then tested through research (Smith et al., 1996). This in essence involves seeing the world –

or at least the part of the world being studied – through a theoretical lens (Hogue, 2015). Alternatively, Grounded theory advocates a research process that is fully data led and should begin with ‘an open mind’ rather than an ‘up-front theory’ to verify (Glaser and Strauss, 1967). As such Grounded Theory is interested in the creation of theory rather than its verification.

As is the case with other qualitative or mixed methods research, this work is informed by elements of both positivism and Grounded Theory. The selection of case study cities and the identification of the specific topic of study – residential densities and densification – was done via scoping research data. This began without the researcher being committed to an upfront theory although existing theoretical literature (reviewed in chapter 2) was consulted to help interpret the data and inform decision-making about how to move forward. In addition, this study is based on a country in which the topic of study has not been covered before and where grounding the research in the data is key to understanding the realities in the field (Blaikie, 1993).

8.3 A typology of housing in Nicaraguan secondary cities established for the first time with accompanying measures of average densities

First of all, this work has succeeded in developing the first typology of housing for Nicaraguan secondary cities with corresponding density profiles. This allows the identification of housing types that contribute most to low density urban sprawl and those that contribute least and which possibly provide opportunities going forward for achieving residential densification and more compact urban development in a way that is acceptable within Nicaraguan society.

The housing typology with density profiles has provided a strong basis on which this study has been built. The typology provided a foundation on which to discuss urban sprawl, density and the potential for more compact urban development including residential densification in the case study cities. For example, a very simple point raised by the typology and the density data was that only one of the housing types (A6, containing sub-types A6a and A6b) comprises housing that has been planned and built in its original form on more than a single storey. However, the density data revealed that sub-type A6a is not among the housing types with the highest average density and at 31 dph, its mean average net residential density is only 2 points above being classified as low-density. This provided a crucial insight, in the early stages of the study, that planning and building areas of housing on more than one storey was not a panacea for achieving densification. Other characteristics of sub-type A6a, e.g. wide access roads and detached housing structures separated by large amounts of private outside space had an enormous impact on overall density.

During development of the housing typology, using the 4 case study cities, 8 housing types were established which together represent the variety of housing stock currently found in Nicaraguan secondary cities. Comprising the typology are types A1 to A6, all of which represent housing developed through formal processes and types A7 to A8 which are representative of housing developed through informal means.

Key to this part of the study was that multiple-characteristics of housing were taken into account when formulating the typology. In fact, not only is the typology itself original but the process of forming the typology is also original, i.e. the characteristics of housing to be considered were decided upon based on observation of housing in the case study cities. One of the characteristics of housing taken into account was its age and its character based on age. Another was location within the city, i.e. whether centrally or peripherally located. In addition, whether areas of housing were planned and built together as part of a masterplan or whether individual housing structures or units were planned and built separately was also considered. Furthermore, the approximate income level of families occupying areas of housing was taken into account. Finally, the ‘physical relationship’ of neighbouring housing units within an area of housing was considered, i.e. whether they are detached, terraced and/or back to back.

Another original aspect of the methodology developed during this study to formulate housing typology was specifically the process of planning and carrying out standardised walking routes through cities in order to gain a detailed but also balanced view of the housing stock. In addition, a specific and standardised process of observation and recording of observational data, along with measures to ensure the security of the researcher and the data, were developed which were successful in producing a standardised approach in each city.

8.4 A methodology developed for the first time for measuring housing densities in Nicaraguan secondary cities

In order to calculate mean average densities for each housing type, an original methodology was developed to measure net residential density in Nicaraguan case study cities was which was based on international definitions of net residential density (Keeble, 1969) (Roberts, 1974) (Greed, 1996). Existing literature could not be found on how this standard international measure could be performed in practice in developing countries with challenges different to those encountered in developed countries. A methodology was developed which overcame the specific challenges encountered in the case study cities and allowed net residential density to be calculated.

The methodology developed included using trigonometry to calculate the area of a test site whose shape is not regular, i.e. not made up of 2 sets of parallel lines, when computer software, high definition satellite imagery or accurate land registry records were not available to measure area.

In addition, the methodology developed included overcoming the challenge of distinguishing, with neighbouring properties (particularly where they were part of a terrace or back to back arrangement of dwellings or where they were semi-detached), where one housing unit started and another one finished. For example, for test sites where the housing was of a historic colonial style (arranged around courtyards) or neighbouring dwellings were terraced or arranged back to back it was sometimes difficult to clearly determine where one dwelling started and the neighbouring one finished. The author developed techniques to overcome these difficulties based on tacit knowledge about Nicaraguan housing and the housing observations which had been done to identify the different housing types. For example, in the case study cities neighbouring dwellings are often demarcated from each other as families identify the extent of their own exterior facade by painting it in a particular colour that is different from that of their neighbours. It is also often the case that metalwork such as that forming exterior doors and shutters is of the same style and/or colour in a single property but different from one property to another. Finally, if dwellings are connected to mains electricity then individual dwellings normally have one electricity meter each on their external facade. Failing all of this, it was always possible to speak to the residents of the dwellings concerned.

8.5 Consultation with a multi-city network of Nicaraguan urban development professionals using a 2-stage Delphi technique

The Delphi technique, ‘discovered’ by Glaser and Strauss in 1967, refined since then and used for qualitative study in a wide range of disciplines has been particularly successful as a technique for collecting and analysing data in fields of study on the ‘distant edges’ (Garrod and Fyall 2005, p. 86) of current knowledge (Rowe and Wright, 1999b), where existing information may be lacking and where the only data available is the ‘hidden’ data held by individuals with experience of the area – these individuals are known in the Delphi technique as ‘experts’ (Yong et al., 1989).

The data which was sought in this study, and to which the Delphi process has been applied, is on the distant edges of current knowledge in that it covers the topics of urban sprawl, the compact city and the potential application of residential densification - on which there has been very little attention paid in developing countries generally, with coverage virtually non-existent in Nicaragua, in either in academia or in practice. Despite urban sprawl, the compact city and residential densification being very widely recognised as being important issues for future growth in the urban areas of economically developed countries, these topics are truly at the distant edges of current knowledge in the economically developing world, and could be perhaps be said to be ‘beyond the distant edges’ in Nicaragua.

It is thus that the advantages of the Delphi technique have been employed in this study to investigate a completely novel area.

Using the Delphi process in this study, the first ever consultation with a multi-city network of Nicaraguan urban development professionals has been conducted, examining participants' experience and perceptions on matters of urban sprawl, compact city thinking and residential densification.

Specifically, the consultation collected and analysed a large set of original data, first of all, looking at participants' experience and perceptions on low density urban sprawl in the cities in which they work. The consultation then explored the participants' perceptions of the potential application of more compact models of development in the cities including residential densification. In addition, the consultation explored participants' perceptions of possible appropriate methods of residential densification for Nicaraguan secondary cities. Furthermore, the consultation evaluated participants' technical knowledge and understanding of measuring net residential density in Nicaraguan secondary cities. Knowledge of numeric measures of housing density was specifically looked at as it serves as a barometer of their technical knowledge on housing density generally - the measures are, after all, the essential way of quantifying the phenomenon. Finally, a major part of the consultation with urban development professionals was to gather their experience and perceptions of the challenges to residential densification in the case study cities.

The data collected and analysed using the Delphi technique adds to, complements and extends the work which began by developing a housing typology and seeks to identify and explore the challenges to residential densification in Nicaraguan secondary cities.

This study has developed knowledge and understanding of how to apply the Delphi technique in a Nicaraguan scenario.

8.6 Limitations of the study and potential for future research

8.6.1 Going ahead to conduct an analysis of the political economy of land speculation in the case study cities

In section 2.4 (in chapter 2) of this thesis, the wider political economic factors affecting density and opportunity for residential densification were analysed. John Stuart Mill's influential writings on the productive use of land were considered (Mill 1848). One of Mill's central messages was that land ownership should be considered in very different terms from the ownership of movable objects. Whereas he considered the right of private ownership over movable objects to be absolute, based on the fact that the labour and initiative of the owner, or the person that had sold or passed the object to the owner, had been invested in creating the object, he stated that land in itself had not been created by man but by nature. Therefore, Mill argued that the right to own a piece of land should only be achieved when the owner was investing labour and initiative into using the land productively. If not, then there should be no inherent right for someone to own a piece of the earth's crust to which we are all entitled by common human heritage.

Where private landowners speculate on the financial value of land, often for long periods of time, without employing it for any productive use or releasing it to the market they violate absolutely Mill's expectation of what a successful political economy should do. There is a body of work from the 1960s and 70s which identifies land speculation as a major factor in the inefficient use of land in urban areas and the piecemeal, scattered development which led to urban sprawl (Archer 1973, Clawson 1962, Sargent 1976). Deininger, Zegarra and Lavadenz (2003) identified that land speculation is a major problem in Nicaragua and theme 6 of the barriers to residential densification in the case study cities identified by this research echoes that.

One possible future extension of this research is to investigate much more deeply the political economy of land speculation in the case study cities. As theme 6 of the barriers to residential densification shows, severe difficulties obtaining land for housing is a key barrier to residential densification. The nature of the political economy of the case study cities is partly responsible for this.

8.6.2 Extending the research to provide an analysis of the role of public space in the case study cities in making residential densification more achievable

There is agreement in literature that high quality outdoor public space is crucial for creating sustainable cities and also that it makes higher density housing more acceptable to communities (Mitchell 2003; Low, Taplin and Scheld 2009; Force and Rogers 1999; Department of the Environment, Transport and the Regions, London (United Kingdom) 2000). In addition, Low (2010) observed that high quality outdoor public space makes higher density cities more attractive to visitors (Low 2010). A possible extension to this research would be to critically analyse the relationship in the case study cities between the provision and quality of public space and residents' attitudes towards residential densification.

8.6.3 Extending the research to analyse the effect of public transport provision and quality on attitudes in the case study cities towards higher density living

It has been widely theorized that infrastructure and services for mobility play a crucial role in making higher density more compact cities possible and allowing them to function sustainably (Williams, Jenks and Burton 2000). A possible extension to this study could be to appraise how current public transport provision in the case study cities, as well as possible changes/improvements, affect residents' attitudes towards higher density living.

8.6.4 Extending the geographic area of study to Atlantic (Caribbean) Nicaragua

The limited resources available to this study meant that it was only possible to focus on one of the two distinct geographic areas in Nicaragua. The focus was 'Pacific and central Nicaragua' and Atlantic (Caribbean) Nicaragua was excluded. The author lived in Pacific/central Nicaragua for 3 years and has significant experience related to that area, including the ability to communicate in Nicaraguan Spanish. In future, it would be possible to extend this research to investigate the same research problem and use the same methodology in cities in Atlantic (Caribbean) Nicaragua. This would help to achieve a truly national view on the research problem in Nicaragua - fully representative of both distinct geographic/cultural areas of the country. Babb (2001) and Baracco (2011) provide interesting accounts of the intriguing cultural, linguistic and other differences between the two 'areas' of Nicaragua.

8.6.5 Investigating the research problem in Managua

In addition, within Pacific and central Nicaragua it was decided that this study should focus on secondary cities (the second tier of cities in terms of population after the primate city or cities in a country) in Nicaragua. This was because these cities have the most dynamic population growth and greatest housing need in the country (particularly for low-income housing). A very worthwhile future endeavour would be to extend this research to investigate the research problem in Nicaragua's capital and biggest city, Managua.

8.6.6 Extending the study to look at tertiary cities in Nicaragua

For this study, 4 of the 5 cities in Nicaragua judged to be secondary cities (based on statistics from INIDE, the Nicaraguan state agency responsible for conducting the annual census) (INIDE, 1995) (INIDE, 2005) (INIDE, 2006) (INIDE, 2008) were used as case studies. A fascinating possible extension to this study would be to investigate the same research problem in smaller, tertiary cities in Nicaragua. During the course of the Delphi process in this study, there were suggestions of how interesting this could be, particularly because of how distinct political and technical arrangements may be in the municipal governments of Nicaragua's secondary cities and its tertiary cities.

8.6.7 Using this work as a basis for a comparative analysis of Nicaragua and another country

It is possible that this work could form the basis for detailed comparative analysis of how the picture of housing in Nicaragua relates to that of other countries – either countries in the same global region as Nicaragua, countries worldwide with similar macroeconomic, political or cultural characteristics to Nicaragua or countries worldwide with very little in common with Nicaragua.

Kemeny and Lowe (1998, p. 3) have proposed that a number of distinct, discernible conceptual approaches have developed over time in the way in which comparative housing research – comparison of housing in one country or region with another – is conducted. At one extreme is the juxtapositional tradition, in which the housing situation in each country or locality is considered as unique, is responsive to a unique set of circumstances, and where it is the differences from one country to another which are highlighted. The other extreme is the more contemporary convergence model in which the housing scenarios of different countries are considered to be significantly universalistic because of the broad internationally recognised economic and historic factors shaping them such as industrialisation or the capitalist economic system. However, Kemeny and Lowe (1998, p. 2) see a conceptual middle ground, the divergence model, as being 'currently one of the major growth points of comparative housing analysis.' They understand the divergence model as being highly aware of the common factors experienced in different countries, which help to create housing systems and introduce similarities between them, but at the same time believing that it is narrower common factors than suggested by the convergence model around which similarities arise. For example, within the divergence model it is considered that 'cultural, ideological [and] political' commonalities (Kemeny and Lowe 1998, p. 2), often expressed in qualitative rather than broad quantitative terms, have more influence on the nature of a country's housing system than the very broad macro economic and historic concepts favoured by the convergence model.

Observations by Briggs and Yeboah (Briggs and Yeboah, 2001) referred to in chapter 6 provide a resource that could be used to support a comparison of the housing typology produced in this study with work on housing in other countries based on Kemeny and Lowe’s (1998) divergence model of comparative housing analsysis. Briggs and Yeboah (2001) describe the ‘cultural’ phenomenon of families in sub-Saharan African cities, having migrated from rural to urban areas, who continue to live ‘a rural lifestyle in the city.’

The ‘cultural’ phenomena affecting the housing systems of urban areas in various sub-Saharan African countries described by Briggs and Yeboah (2001) are also experienced in Nicaraguan secondary cities, as was identified in chapter 6 of this thesis. These common cultural phenomena fit with the ‘cultural, ideological [and] political’ commonalities (Kemeny and Lowe 1998, p. 2) which the divergence model of comparative housing analsysis looks out for.

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Appendices

Appendix 1

Below is the semi-structured Delphi round 1 questionnaire that was given to local government employees in the 4 case study cities:

Semistructured Delphi questionnaire

1. In your experience, is the term ‘residential density’ used in Nicaragua? If that term is not used, is any similar term used? If ‘residential density’ or a similar term are used, in what contexts are they used?

2. Whether or not , in your experience, the term ‘residential density’ is used in Nicaragua, how would you define it?

   As an aid to this discussion, we will now look at some photographs of types of housing found in Nicaraguan secondary cities with an indication of their relative densities (e.g. high, medium or low). We will also discuss how the densities of these housing types compare with urban densities in other countries you have visited. If you haven’t visiited other countries we will discuss any opinions you have on how the densities of the housing types in Nicaraguan secondary cities compare with urban densities around the world.

3. In your opinion, how should ‘residential density’ be measured?

   At this point, we will discuss the definition of the term ‘urban sprawl.’

4. In your opinion, is urban sprawl occuring in the city in which you work?

5. If you think that urban sprawl is happening in the city in which you work, do you think that it is having a net positive or negative impact on the city?

There is an approach to planning cities called the 'Compact City.' The text below is from the document 'Introduction to the research' and it explains the approach and its benefits.

Burgess (2000, p. 9) define el enfoque:

"Los enfoques contemporáneos de la ciudad compacta [tienen como objectivo] ...."Aumentar las densidades de población de la superficie de construcción y de las áreas residenciales; intensificar las actividades económicas urbanas, sociales y culturales y manipular el tamaño urbano, la forma y la estructura y los sistemas de asentamientos en búsqueda de los beneficios de la sostenibilidad ambiental, social y global derivados de la concentración de funciones urbanas. "

Aumentando la densidad de población residencial con el fin de acercarse a la Ciudad Compacta es principalmente logrado a través de la 'densificación residencial' (elevando la densidad residencial medidas en número de viviendas por hectárea).

La cita anterior indica los beneficios de la Ciudad Compacta en términos generales. Para las ciudades secundarias nicaragüenses hay una serie de beneficios específicos adicionales. El terreno para desarrollo de viviendas en y en los alrededores de las ciudades secundarias nicaragüenses es muy difícil de obtener, en particular para viviendas destinadas a familias de bajos ingresos. El aumento de la densidad residencial en las zonas de viviendas existentes o en los planes de desarrollo futuro para la vivienda, ya en tierras garantizadas, puede ayudar a satisfacer la demanda de vivienda y reducir la necesidad de familias de bajos ingresos para construir asentamientos informales en las zonas donde a menudo hay riesgos ambientales.

El enfoque de la Ciudad Compacta en las ciudades secundarias nicaragüenses reduciría la necesidad para el desarrollo futuro de viviendas en las periferias de las ciudades, a largas distancias de los centros urbanos. Como resultado, los costes de la futura infraestructura se reducirían, así como la cantidad de nuevas viviendas creadas con mala accesibilidad a las zonas urbanas centrales y habría menos tierras rurales perdidas alrededor de las ciudades. Esta tierra rural conservada podría utilizarse para la producción agrícola y podría incluir áreas de especial interés científico o de la belleza natural que podrían ser utilizados para promover el turismo.

Dentro y cerca de las zonas localizadas de la vivienda donde hay hacinamiento, la densificación residencial podría hacer posible la reducción del hacinamiento en esas zonas. Algunos residentes de las zonas superpobladas podrían ser realojadas en nuevas viviendas situadas en las cercanías y creado por densificación. Esto significa que sería posible reducir el hacinamiento sin forzar a la gente a trasladarse lejos de sus lugares de origen y apoyo familiar que están establecidos allí.

6. Do you think using the ‘Compact City’ approach in the city in which you work would be good or bad for the city?

At this point, we will discuss the definition of the term ‘residential densification.’

7. Do you think using ‘residential densification’ in the city in which you work would be good or bad for the city?

8. If you think that using residential densification in the city in which you work would be good for the city, what methods of residential densification do you think would be appropriate?

9. In your opinion, what are the barriers to residential densification in the city in which you work?

Appendix 2

Below is the semi-structured Delphi round 2 questionnaire that was given to local government employees in the 4 case study cities:

Semistructured Delphi questionnaire

1. In the first questionnaire, you answered the question: ‘how should residential density be measured?’ The responses from all participants have been collected and all of the measures suggested by at least one person are listed below. From the list, select your top 3 preferred measures to act as a standard measurement for Nicaraguan secondary cities. Of those 3 please select the measure you think is the first most appropriate, the measure you think is the second most appropriate and the measure you think is the third most appropriate.

Suggestion for measure of residential density from questionnaire 1	**Mark a 1 for your first most appropriate measure, a 2 for your second most appropriate measure and a 3 for your third most appropriate measure**
Inhabitants per manzana	
Inhabitants per hectare	
Inhabitants per barrio	
Inhabitants per square metre	
Families per manzana	
Dwellings per manzana	
Dwellings per hectare	
Size of plot	
Proportion of plot occupied by housing structure(s)	
Inhabitants per dwelling	

2. In the first questionnaire, you answered the question: ‘in your opinion, what are the barriers to residential densification in the city in which you work?’ The responses from all participants have been collected and barrier ‘themes’ have been identified. They are listed below. The researcher will provide more details verbally about what participants said on these themes. Please give any details you can about each barrier ‘theme’ in the city in which you work.

Barrier theme
An inactive land market: any attempts to use compulsory purchase are controversial, difficult for government to succeed in land negotiations, national government even less active in the case study cities than local government
High demand for housing not met resulting in high levels of informal housing development: informal housing development not formally planned so inability to strategically plan its location to prioritise infill development
Small amounts of formal sector housebuilding: very small amounts of housebuilding by Nicaraguan formal private sector, low levels of housebuilding by the state – smaller state than in the past and most of current ALBA/Sandinista housebuilding in Managua, also difficulties for state to act as housing enabler, low formal sector housebuilding means difficult to get homes built where city plans indicate
Dominance of single storey housing: Fears of earthquake damage to housing of more than one storey, lack of state housebuilding means self build by families common (sometimes as part of formally supported schemes, sometimes not) which makes it less likely housing will be built with earthquake resistance, expertise and resources in earthquake resistant commonplace internationally but not widely available in Nicaragua
Government practices: elected members of government not informing themselves on matters of planning and housing, non-transparent recruitment practices in public sector including in areas of planning and housing, disfunctionality of the INVUR national housing agency, planning frameworks developed in parallel by different local governments resulting in different approaches – an inconsistent approach
Policy implementation in areas of planning and housing: many examples of coherent policy/plans proposing schemes which would result in residential densification which are wholly or partially unimplemented

Historic tendency for low housing density in Nicaragua: in Nicaraguan countryside and cities people have got used to having a low-density lifestyle, a strong desire bordering on a feeling of entitlement towards having a patio where a range of activities can be done inc. household chores, play, income generating activities and even some small scale agriculture, before 1972 earthquake Managua a much higher density city – the earthquake set up a preference for housing limited to a single storey because of such extensive damage to multi-storey structures
Legal and financial difficulties with the sub-division of existing plots and structures: inactive property market despite demand for housing reduces financial incentives for sub-division, NTON regulations create legal barriers to sub-division
Lack of opportunities for staff professional development or discussion of good practice internationally: and dialogue on ideas for Nicaraguan urban development professionals: lack of contact with rest of the world for sharing good practice, C2C support more oriented towards individual projects rather than staff professional development, lack of staff training opportunities

Appendix 3

Below is the semi-structured Delphi round 1 questionnaire that was given to participants working in Nicaraguan academia (the Delphi round 2 questionnaire was the same as the one given to local government employees):

Semistructured Delphi questionnaire

1. In your experience, is the term ‘residential density’ used in Nicaragua? If that term is not used, is any similar term used? If ‘residential density’ or a similar term are used, in what contexts are they used?

2. Whether or not , in your experience, the term ‘residential density’ is used in Nicaragua, how would you define it?

As an aid to this discussion, we will now look at some photographs of types of housing found in Nicaraguan secondary cities with an indication of their relative densities (e.g. high, medium or low). We will also discuss how the densities of these housing types compare with urban densities in other countries you have visited. If you haven't visiited other countries we will discuss any opinions you have on how the densities of the housing types in Nicaraguan secondary cities compare with urban densities around the world.

3. In your opinion, how should 'residential density' be measured?

At this point, we will discuss the definition of the term 'urban sprawl.'

4. In your opinion, is urban sprawl occuring in any of the following cities: Granada, León, Masaya, Matagalpa?

5. If you think that urban sprawl is happening in any of the cities in question 4, do you think that it is having a net positive or negative impact on the city or cities?

There is an approach to planning cities called the 'Compact City.' The text below is from the document 'Introduction to the research' and it explains the approach and its benefits.

Burgess (2000, p. 9) define el enfoque:

"Los enfoques contemporáneos de la ciudad compacta [tienen como objectivo] ....”Aumentar las densidades de población de la superficie de construcción y de las áreas residenciales; intensificar las actividades económicas urbanas, sociales y culturales y manipular el tamaño urbano, la forma y la estructura y los sistemas de asentamientos en búsqueda de los beneficios de la sostenibilidad ambiental, social y global derivados de la concentración de funciones urbanas. "

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La cita anterior indica los beneficios de la Ciudad Compacta en términos generales. Para las ciudades secundarias nicaragüenses hay una serie de beneficios específicos adicionales. El terreno para desarrollo de viviendas en y en los alrededores de las ciudades secundarias nicaragüenses es muy difícil de obtener, en particular para viviendas destinadas a familias de bajos ingresos. El aumento de la densidad residencial en las zonas de viviendas existentes o en los planes de desarrollo futuro para la vivienda, ya en tierras garantizadas, puede ayudar a satisfacer la demanda de vivienda y reducir la necesidad de familias de *bajos ingresos para construir asentamientos informales en las zonas donde a menudo hay riesgos ambientales.*

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Dentro y cerca de las zonas localizadas de la vivienda donde hay hacinamiento, la densificación residencial podría hacer posible la reducción del hacinamiento en esas zonas. Algunos residentes de las zonas superpobladas podrían ser realojadas en nuevas viviendas situadas en las cercanías y creado por densificación. Esto significa que sería posible reducir el hacinamiento sin forzar a la gente a trasladarse lejos de sus lugares de origen y apoyo familiar que están establecidos allí.

6. Do you think using the ‘Compact City’ approach in any of the cities in question 4 would be good or bad for the city?

   At this point, we will discuss the definition of the term ‘residential densification.’

7. Do you think using ‘residential densification’ as an approach in any of the cities in question 4 would be good or bad for the city?

8. If you think that using residential densification would be good for the city or cities, what methods of residential densification do you think would be appropriate?

9. In your opinion, what are the barriers to residential densification in Granada, León, Masaya, Matagalpa?